International Wader Study Group

Annual Conference
26–29 September 2014

Haapsalu, Estonia

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Haapsalu, Estonia

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ISBN 978-9949-536-60-3

Layout Kuma Print

Friday, 26 September 2014		
from 16:00	**registration**	Haapsalu Kultuurikeskus (Cultural Centre)
19:30	**dinner**	
21:00	**welcome and film**	

Saturday, 27 September 2014				
9:00	**welcome | Annual General Meeting AGM**			
10:00	**coffee and posters**			
	Session A		**Session B**	
	spatial distribution | fuelling		*genetics | moult*	
10:30	**Barshep**	Understanding waterbird population dynamics through functional ecology groupings	**Conklin**	Sanderlings and Red Knots conquered the world differently: genetic divergence between Greenland and Siberian populations.
10:50	**Ntiamoa-Baidu**	Prey density explains seasonal patterns of occurrence of Sanderling *Calidris alba* on a sandy beach in Ghana.	**Rönkä**	Genetic diversity and dispersal distribution in the endangered Baltic Southern Dunlin *Calidris alpina schinzii*.
11:10	**Franks**	Does non-breeding habitat affect breeding condition and reproductive trade-offs in an arctic-breeding shorebird?	**Lank**	Sex allocation mitigates sexually antagonistic selection on alleles controlling development of female mimic male Ruffs

11:30	**Verhoeven**	Fuelling and moult of Red Knots: visual estimates of differences between ages, sexes and subspecies?	**Niemc**	Sex and age differences in body moult of Little Stint *Calidris minuta* at non-breeding grounds in South Africa
11:50	**Karagicheva**	Hierarchical regulation of spring body mass gains and losses in Red Knots *Calidris canutus islandica*	**Remisiewicz**	Age differences in body mass, and pre-migratory fattening related to primary moult, in Wood Sandpipers *Tringa glareola* in southern Africa.
12:10	**poster session**			
13:00	**lunch**			
	Session A		**Session B**	
	breeding biology | *physiology* | *morphology*		*migration* | *habitat choice*	
14:20	**Bulla**	Incubation patterns of biparental shorebirds: a comparative study.	**Lindström**	Small variations on a grand theme: the migration of the Great Snipe *Gallinago media*.
14:40	**Kubelka**	Small story about big eggs: the fate of Northern Lapwing chicks.	**Pakanen**	Geolocators reveal migration and wintering ecology of the southern Dunlin *Calidris alpina schinzii*.
15:00	**Pialkova**	Egg and chick sex-biased size dimorphism in Northern Lapwings *Vanellus vanellus*.	**Korniluk**	Ranging behaviour of Great Snipe males in E Europe - GPS telemetry results.
15:20	**Ruthrauff**	Environmental and ecophysiological constraints on the winter distribution of Rock Sandpipers *Calidris p. ptilocnemis*.	**Karlikova**	At what scale does anti-predation grouping facilitate association in redshanks?

15:40	**Sánchez Gutiérrez**	Combined effects of salinity and temperature on the physiology of two Red Knot subspecies with contrasting non-breeding life histories.	**Collop**	Assessing the potential for conflict between wintering birds and recreational activities in Poole Harbour, UK.
16:00	**Makarov**	The bill tip organ of the Spoon-billed Sandpiper and some other sandpipers.	**Bowgen**	Quantifying the pressures placed on wading birds by environmental change and the role of predictive modelling.
16:20	**coffee and posters**			
	Session A		**Session B**	
	meadow birds		*diet* | *conservation* | *management*	
17:20	**Senner**	Climate change is only half the problem: agricultural management inhibits the ability of Black-tailed Godwits to respond to climate change	**Lourenco**	Diet of four wader species at Banc d'Arguin, Mauritania, based on faecal and stable isotope analyses.
17:40	**Kentie**	Metapopulation dynamics of Black-tailed Godwits in a fragmented agricultural landscape	**Phillipe**	Shorebird distribution depending on predictability of trophic resources. Study case: Yves Bay (Bay of Biscay, October 2010
18:00	**Sviridova**	Land abandonment and polarization of agriculture – what are the challenges for waders?	**Woodley**	Populations and conservation status of New Zealand shorebirds.
18:20	**Mischenko**	Trends of wader populations in the flood plains of Central Russia resulting from changes in land-use and spring floods	**Tierney**	Dublin Bay birds: monitoring, marking and tracking waterbirds in an Irish estuary.

18:40	**Clausen**	Disease reveals the predator: the interplay between canine disease outbreaks, red fox and meadow bird populations in Denmark.	**Manton**	Governance and management for ecological sustainability: avian predation on waders.
19:00	**dinner**			

Sunday, 28 September 2014		
7:00	**excursions** departure from Cultural Centre	
12:00	back from excursions	
13:00	**lunch**	
	conservation | *demography*	
14:30	**Pearce-Higgins**	A review of threats to *Numeniini* populations around the world.
14:50	**Gillings**	40 years of change for British and Irish breeding waders: results from atlas projects.
15:10	**Riegen**	The importance of Yalu Jiang Wetland National Nature Reserve for shorebirds during northward migration 1999 – 2010.
15:30	**Rhakimberdiev**	Seasonal survival patterns in Red Knots *Calidris canutus islandica*.
15:50	**coffee and posters**	

	*climate change	breeding ground behaviour*	
17:00	**Alves**	Hot and warm: consequences of rising temperatures for breeding and beyond.
16:50	**Reneerkens**	Climate change effects on survival and reproduction in an Arctic migratory bird species
17:10	**Lanctot**	Conservative and opportunistic settlement strategies in Arctic-breeding shorebirds
17:30	**Kempenaers**	The truly exploded lek: breeding site sampling by male Pectoral Sandpipers
17:50	closing of the conference	
19:30	**social evening with dinner**	

Monday, 29 September 2014		
workshop: Threats and protection of meadow birds in Europe		
10:00	**introduction**	
10:10	**Jóhannesdóttir**	Iceland
10:40	**Thorup**	Denmark and Sweden
11:10	**Pehlak**	Eastern Baltic
11:40	**Kubelka**	Central-East Europe

12:10	**lunch**	
13:00	**Mischenko**	European Russia
13:30	**Hötker**	Germany
14:00	**Teunissen**	The Netherlands
14:30	**Smart**	UK
15:00	**coffee**	
15:30	**Roodbergen**	overview presentation
16:00	**discussion**	
17:30	**data session**	
19:00	**dinner**	

Abstracts of talks

Understanding waterbird population dynamics through functional ecology groupings

Yahkat Barshep[1], Birgit Erni[2], Les Underhill[1] & Res Altwegg[2]

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Every year a count of waterbirds is carried out at major wetlands in Southern Africa. One objective of these counts is to provide an assessment of the population status of both resident and migratory birds, especially within the context of climate change and habitat modification. Using state-space models which account for observation errors, we obtained estimates of population levels of resident and migratory waterbirds in South Africa. Using an index which quantified population change between1995 and 2009, we constructed regression trees to identify species groupings based on similar ecological and life-history characteristics. Birds were characterized based on body-size, type of wetland they predominantly inhabit, average brood-size, and foraging guild. The group of resident species that had undergone the greatest decline are polygamous species (21%) and small to medium sized monogamous species that produce an average brood-size greater than 3.5 (14%). Medium to large (>59cm) monogamous species had the greatest population increase (21%). In migratory waterbirds, species with their core breeding range south of 60°N had the greatest population decline (73%). For species with a breeding range north of 60°N, larger species (>31cm) had the least population decline (6%), and medium-sized species (22.5-31.5 cm body size) had the greatest decline (57%), while small species (<22 cm) had an intermediate decline (28%). Our results show that using broad ecological themes that unite taxonomically different groups can be a means of testing possible ecological pressures that account for species' responses to environmental change while revealing life-history traits that might buffer against risk of extinction.

Prey density explains seasonal patterns of occurrence of Sanderling *Calidris alba* on a sandy beach in Ghana

Yaa Ntiamoa-Baidu[1,2], Jones Quartey[1] & Alfred Ali Nuoh[1]

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20-years of monthly counts of non-breeding populations of Sanderling *Calidris alba* on the Ghana coast show a clear seasonal pattern of occurrence. Sanderlings start arriving there from August, numbers peak in September/October, and by November, the number remaining is 30-40% of the peak observed in the northern autumn. Evidence from ringing recoveries indicates that Sandelings leaving the Ghana coast go further down the south western coast of Africa. A second peak is observed in February/March during the northward migration to the breeding grounds in some years, but not in others.

To explain the factors accounting for the observed patterns, we studied the relative abundance of prey items on the most important site for Sanderling in Ghana, the Esiama beach, a 13 km beach between the Amansuri and Ankobra estuaries in the western region of Ghana. We took core samples of benthos at 500 m intervals of the beach once a month between Mar 2011 and Dec 2012. Seven groups of invertebrates were recorded: Amphipoda, Nemertea, Glyceridae, Terebridae and *Donax pulchelus*, but the species that occurred with any degree of abundance and constituted the bulk of the prey for Sanderling was *D. pulchellus*. The size (length) of *D. pulchellus* recorded ranged from 2.2 mm-11.79 mm, mean 7.76 mm (SD 1.31). Densities varied from 0.015 to 0.44 per cm^2 at the two estuarine ends of the beach to 2.65 per cm^2 on the sandy beach. *D. puchellus* showed two peaks of abundance, Aug-Oct and Mar-Apr, which coincide with the periods when Sanderling numbers are highest.

Does non-breeding habitat affect breeding condition and reproductive trade-offs in an arctic-breeding shorebird?

Samantha E. Franks[1,3], David J. Hodkinson[2], David B. Lank[3], Eunbi Kwon[4], Richard B. Lanctot[5], W. Alice Boyle[4], T. Kurt Kyser[6], & H. River Gates[5]

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3. *Simon Fraser University, Canada*
4. *Kansas State University, USA*
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6. *Queen's University, Canada*

Events occurring outside the breeding season have been widely recognized as having the potential to carry-over and affect reproductive success. Spending the winter in habitats of differing qualities can result in individuals making the transition to the breeding season in different conditions, with consequences for breeding arrival time and the timing of clutch initiation, which are strongly linked to reproductive success. Winter carry-over effects may also be evident in the trade-off between adult condition throughout a breeding attempt, and reproduction. Affected parameters could include the resources put into eggs, the amount of adult mass lost during incubation, the level of parental care provided to offspring following hatch, and the level of adult stress hormones such as corticosterone. We used stable isotope analysis of winter-grown feathers to investigate whether winter habitat influenced reproductive parameters in the Western Sandpiper *Calidris mauri*, which breeds in wet tundra habitats across much of W Alaska and E Siberia. Stable-nitrogen ($\delta^{15}N$) and carbon ($\delta^{13}C$) values vary substantially across the non-breeding range, but explained little of the overall variation in clutch initiation date. Factors such as site experience and mate fidelity, as well as strong selection on the timing of breeding due to a pronounced peak in seasonal resources, likely play a greater role in influencing clutch initiation date among individual Western Sandpipers. Winter $\delta^{15}N$ and $\delta^{13}C$ did not have any apparent affect on nest survival or mass change during incubation. However, female winter $\delta^{13}C$ values were strongly positively correlated with average egg-volume. The relationship between winter stable isotope values and egg-size may be a consequence of adult condition early in the breeding season, and blood corticosterone measured early in incubation may represent a mechanistic link between winter conditions and resources available for breeding.

Fuelling and moult of Red Knots: visual estimates of differences between ages, sexes and subspecies?

Mo Verhoeven[1,2], Joop van Eerbeek[1], Chris Hassell[3] & Theunis Piersma[1,2]

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From late February to late May, Red Knots *Calidris canutus* in Roebuck Bay, NW Australia prepare for a 4,500km non-stop flight to the Yellow Sea. In 2011, we documented through visual observations of abdominal profiles and breeding plumage the migratory preparation of individual knots of known age, sex and subspecies in order to compare rates of fuelling and pre-alternate moult among these different groups. Our results show that large differences in these rates exist between juveniles deferring their migration and older migratory birds. We also found that male knots start fuelling earlier than females, but accumulate their reserves at a slower pace. And, although males and females started their pre-alternate moult at the same time, males performed a more extensive moult. Additionally, *C.c. rogersi* - one of two knot subspecies present at the site - began fuelling and moulting earlier than did *C.c. piersmai*, but moulted more slowly, while fuelling at a similar rate. Finally, we found that most knots, irrespective of their sex or subspecies, reached maximum scores in the same week (2-8 May) and, similarly, that both subspecies departed on their northward migration at the same time. Taken together, this points to a bottleneck that constrains the rate at which *C.c. rogersi* and male knots - regardless of subspecies - are able to prepare for migration. The existence of such a bottleneck is not surprising given earlier findings of heat-loading problems in this tropical ecosystem, which results in slow fuelling rates, but suggests that precise timing is required to properly schedule the knot annual cycle. Future fluctuations in resource abundance could thus have dramatic consequences for knots' ability to prepare for northward migration. Furthermore, this is the first study to report on the migratory preparation and departure timing of both subspecies and counters previous hypotheses proposing separate schedules for *C.c. rogersi* and *piersmai*.

Hierarchical regulation of spring body mass gains and losses in Red Knots *Calidris canutus islandica*

Julia Karagicheva[1], Eldar Rakhimberdiev[1,2,3], Anne Dekinga[1], Anita Koolhaas[1], Maarten Brugge[1] & Theunis Piersma[1,4]

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We followed annual patterns of body mass gain and loss in Red Knots *Calidris canutus islandica* throughout their long-term (up to 20 year) stay in captivity. Kept in outside aviaries, the birds experienced the natural photoperiodic conditions of their wintering site in the Wadden Sea, but had no access to other seasonal cues, like tidal cycles or food abundance. Weather cues were mitigated due to the sheltered construction of the aviaries. We compare body mass cycles observed in captivity with natural patterns, reconstructed from data on wild Red Knots, collected at different stop-over sites, and with patterns expressed by captive Red Knots in 12h:12h constant light conditions. Our results prove that photoperiod has an important role in the regulation of spring fattening for northward migration. However, internal circannual rhythm and non-photic environmental cues may also be involved. We discuss the complexity of the spring body mass peak which we argue consists of several phases with different regulatory mechanisms.

Sanderlings and Red Knots conquered the world differently: genetic divergence between Greenland and Siberian populations

Jesse R. Conklin[1,2], Jeroen Reneerkens[1], Yvonne I. Verkuil[2], Pavel S. Tomkovich[3], Per J. Palsboll[2] & Theunis Piersma[1]

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It was long held that Sanderlings *Calidris alba* breeding in NE Greenland occurred in W Europe only during migration to and from non-breeding areas in W Africa, whereas birds wintering in W Europe were of Siberian breeding origin. However, recent ring-recoveries show that Greenlandic Sanderlings winter all along the North Sea and Atlantic coasts from the United Kingdom to South Africa, while evidence of Siberian birds wintering in Europe has yet to materialize. In Red Knots, which share nearly identical breeding habitats and distribution with Sanderlings, Greenland and Siberian populations (*C. canutus islandica* and *canutus*, respectively) are among the most distantly related among six subspecies. If the analogous Sanderling populations are similarly differentiated, this may: 1) support a parallel post-glacial global expansion in the two species, and 2) provide a molecular tool for assessing the breeding origin of Sanderlings along the East Atlantic Flyway. However, we found no significant genetic differentiation (in mtDNA and seven microsatellite loci) between Sanderling breeding populations separated by 2,000 km and differing in migration timing and routes. These results suggest a very different evolutionary history than that of Red Knots, and may reflect recent colonization of a flyway or unexpectedly high exchange of individuals between breeding areas.

Genetic diversity and dispersal distribution in the endangered Baltic Southern Dunlin *Calidris alpina schinzii*

Nelli Rönkä[1], Veli-Matti Pakanen[1], Angela Pauliny[2], Donald Blomqvist[2], Ole Thorup[3], Hannes Pehlak[4], Laura Kvist[1], Kari Koivula[1]

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Genetic analyses provide an indirect way of studying the state and development of populations. Besides obtaining information on the genetic variation *per se*, with genetics, one can gain knowledge of the behavior of the individuals, e.g. in the context of gene flow. Information on the genetic status and migration rates between subpopulations is important in order to evaluate the need for management and conservation actions aiming to maintain the genetic variation of the population and to ensure its viability.

When the population is small, such as in the case of the Baltic Southern Dunlin, the lack of gene flow between local populations may lead to rapid genetic differentiation between them. If dispersal between the subpopulations exists, ensuring good and large enough breeding habitats is important e.g. to attract immigrants and thus help to keep the genetic variation of the populations at a sufficient level. Genetic variation forms the basis for evolutionary change – without it there is nothing natural selection can work on.

In this study we examine the genetic variation, population differentiation and dispersal distribution within the Baltic Dunlin population by analyzing 13 microsatellite loci. We have samples from the Finnish Bothnian Bay, SW Finland, Estonia, S Sweden and Denmark. All the data have been collected and the laboratory work done, and the preliminary results already reveal the existence of private alleles, indicating at least some structuring.

More than half of the wader species in the world are in decline, including the Baltic Southern Dunlin: classified as critically endangered in all of its breeding countries in the Baltic area, it is one of Europe's most endangered wader populations. This work is important – besides having concrete implications for the conservation of the Baltic Dunlin, it will also provide basic knowledge which will aid authorities to plan conservation and management actions for endangered species in general.

Sex allocation mitigates sexually antagonistic selection on alleles controlling development of female mimic male Ruffs

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Ruffs have three genetically distinguished male morphs that pursue different mating strategies. Females that inherit the rare 'faeder' (='female mimic') morph gene are smaller than normal females (Lank *et al.* 2013 *Biol Lett* 9, 20130653). I report here that these small females appear to have lower fitness than normal females, and that females appear to alter sex ratios conditional on the male fertilizing each egg. In captivity, small females are slow to start egg-laying, lay smaller eggs, and fledge fewer young than normal sized females, suggesting that their fitness is lower. To maintain faeder alleles in the population, the average mating success of faeder males must be higher than that of ornamental males. Thus sexually antagonistic selection occurs at this locus, since those carrying the allele will have a higher fitness as a male than as a female. The sex ratios of migrant wild juvenile Ruffs are strongly female-biased (35-40% M, Jaatinen *et al.* 2010 *Ornis Fennica* 87:125-134 and papers cited within), and a female bias in chick sex-ratios, dependent on female condition, was suggested based on wild clutches (Thuman *et al.* 2003: *Mol Ecol* 213-218). I have bred Ruffs in captivity since 1985, and introduced faeders in 2006. Fledged young fathered by 'independent' males are strongly female-biased (39% M, n=285), similar to wild ratios, which consist of ca. 85% independents. Young fathered by satellites are less female-biased (46% M, n=175), while those fathered by faeders have an even sex-ratios (51% M, n=82). Either sex allocation at the ovum level, or differential mortality could account for the results. Molecular sexing unhatched eggs and chicks dying prior to fledging show no biases different from those of fledged chicks. Females appear to turn off the mechanisms responsible for a general female sex-bias, and by producing more males, thereby partially offset intralocus conflict at the faeder allele.

Sex and age differences in body moult of Little Stint *Calidris minuta* at non-breeding grounds in South Africa

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We determined if pre-breeding and post-breeding body moult strategies differed between sexes and age classes of Little Stints during their non-breeding season in South Africa. We analysed moult records of 367 Little Stints captured during September-April 2007-2013. We distinguished the post-breeding (September-December) and pre-breeding (January-April) moult periods by piecewise linear regression. From January, immatures and adults were treated jointly because they cannot be distinguished by plumage. We estimated the proportion of new feathers on the head, back and scapulars in 20%-wide intervals for each bird and then summed the results as a body moult index. Scores for lesser, median and greater coverts were summed as a wing index. The body and wing indices were converted to a scale from 0 to 1 and then transformed using a logit function. Little Stints show no sexual dimorphism, so we sexed them by DNA (PCR, P2/P8 primers) from blood samples collected in the field. In the post-breeding season the proportion of males and females was equal in both age classes (χ^2= 0.15, p=0.69). The proportion of immature birds increased from September to December (GLZ: W=12.22, p<0.001). The immatures' body moult was delayed by about 40 days compared with adults (ANCOVA: F=12.82, p<0.001). The proportion of males decreased during the pre-breeding season (GLZ: W=6.05, p=0.014) and by mid-April mostly females stayed at the site. Females moulted faster (b=0.048) and were more advanced in the replacement of feathers than males (b=0.028). Sex and age showed no effect on the wing index during post-breeding and pre-breeding moult. The sex differences in moult might be connected with the males' earlier departure to the breeding grounds, which probably gives them an advantage at stopover and breeding sites. The later departure of females might reduce their risk of encountering adverse weather on arrival at the breeding grounds.

Age differences in body mass, and pre-migratory fattening related to primary moult, in Wood Sandpipers *Tringa glareola* in southern Africa

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Wood Sandpipers at their southernmost African non-breeding grounds show varied moult strategies: adults renew all primaries before late-December, but first-year (immature) birds replace 2-6 outer primaries by the end of March, before they depart to their breeding grounds. We aimed to determine any age differences in the relationship between moult patterns, body mass and premigratory fattening of Wood Sandpipers during their stay in southern Africa. We analysed the body masses at first capture of 1,794 adults and immatures for which the details of primary moult and mass were recorded, and of 73 birds caught twice. The study period spanned 25 years (1972–96) and birds were captured between July of each year and May of the following year at freshwater wetlands in Zimbabwe. Between September and mid-March the body masses of adults and immatures were almost constant; immatures were on average 1.3g lighter than adults (59.4g vs 60.7g). Immatures during partial moult of 3, 4 or 5 outer primaries did not differ significantly in body mass (K-W ANOVA: $H_{2,47}=3.22$, $P=0.20$). Pre-migratory fattening began about 7 Feb in adults and 22 Feb in immatures. After these dates, 2.3% of adults and 52% of immatures were in active primary moult. At the population level, immatures which had completed moult were on average 3.8g lighter than adults (64.7g vs 68.5g). From February onwards the body masses of immatures increased on average more slowly (0.22g/day) than those of adults (0.45g/day). The estimated mean departure body masses were 78.3g for immatures and 81.3g for adults. This would enable both immatures and adults to reach the Great Rift Valley, and the heaviest birds to reach the southern Nile Valley in one non-stop flight. In immatures, overlapping the completion of primary moult with pre-migratory fattening probably explains why they gain body mass more slowly than adults, which separate these two processes by up to four months.

Incubation patterns of biparental shorebirds: a comparative study

Martin Bulla, Anne L. Rutten, Mihai Valcu & Bart Kempenaers

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Incubation is a major part of avian parental care. However, thorough investigations of how biparentally incubating species share their duties within a 24h period and over the incubation period are scarce. Our aim is to compare biparental incubation patterns across shorebirds breeding in different environments and ultimately to suggest and test hypotheses that may explain between- and within-species variation in biparental incubation patterns. To date, we have used data from radio frequency identification systems from 17 species (and subspecies) and data from other systems (geolocators, videos) collected by our collaborators (15 other species or subspecies). The aims of the presentation are to (1) demonstrate the observed variation in biparental incubation patterns, (2) suggest possible explanations for this variation and (3) make a call for further collaboration to augment the sample size for current species or add new species to the dataset.

Small story about big eggs: the fate of Northern Lapwing chicks

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Egg-size in birds reflects the reproductive investment of parents and represents an important parameter which affects subsequent chick growth and survival. It is more important in precocial species where chicks must search for food themselves after hatching and are faced with more severe environmental conditions than altricial nestlings. Heavier chicks hatch from bigger eggs and they perform better due to this initial advantage. They are capable of longer self-contained thermoregulation, of more effective foraging and of more easily escaping from predators; all factors that result in higher survival compare with smaller chicks. Hence there appears to be selection pressure on egg-size. Apart from the intrinsic functional constraints and female quality, variability in egg-size is also influenced by such environmental factors as ambient temperature and food supply during egg formation. The Northern Lapwing *Vanellus vanellus* with its invariable four-egg clutch is a suitable model species for investigating environmental factors affecting egg-size.

We measured the size of eggs in more than 700 lapwing clutches from various breeding habitats in South Bohemia, the Czech Republic, during 1982–2014. In this contribution, we test whether seasonal trends in egg-size are affected by weather conditions and whether some particular breeding habitats can play a role in the formation and later-laying of bigger eggs. These and other questions concerning the ecological consequences of the patterns we found and possible conservation implications will be discussed during the presentation.

Egg and chick sex-biased size dimorphism in Northern Lapwings *Vanellus vanellus*

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In sexually size dimorphic birds with a polygynous breeding system, where the fitness return from male and female offspring differs, adult females may give advantages to offspring of the more beneficial sex according to the sex allocation theory. Thus females may affect the performance and fitness of sons and daughters by differential allocation of resources to the eggs depending on their sex. Egg-size is considered a reliable predictor of maternal investment in an egg and consequently in chick-size at hatching. Larger chicks should have advantages over smaller conspecific chicks, especially because they should have greater amounts of available nutritional resources.

In this study, we analyzed variability of egg-size in relation to embryo sex and sex-specific size dimorphism in Northern Lapwing *Vanellus vanellus* hatchlings. In this species, males are the larger sex and are expected to have higher nutritional requirements for maintenance and growth. We therefore predict that males chicks will be heavier and larger at the time of hatching and that they will hatch from larger eggs. We will present results based on two years (2013, 2014) study of the Northern Lapwing breeding population of the Czech Republic.

Environmental and ecophysiological constraints on the winter distribution of Rock Sandpipers *Calidris p. ptilocnemis*

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Rock Sandpipers *Calidris p. ptilocnemis* have the most northerly non-breeding distribution of any shorebird in the Pacific Basin, including the upper Cook Inlet, Alaska (61°N, 151°W), a location that is also the coldest non-breeding site regularly used by shorebirds during winter. We integrated physiological, metabolic, behavioural, and environmental aspects of the non-breeding ecology of *ptilocnemis* at the northern edge of their range to determine the relative importance of these factors in facilitating their unique non-breeding ecology. Not surprisingly, estimated daily energetic demands were greatest (373 kJ) during the coldest periods of winter (January). These estimates are up to 7.2 times greater than *ptilocnemis* basal metabolic rates, a scale of increase that approaches the maximum sustained rates of energetic output by migrating shorebirds, and far exceeds them in duration. We assessed the quality of their primary prey, the bivalve *Macoma balthica*, to determine the daily foraging duration required by *ptilocnemis* to satisfy such energetic demands. Based on size-specific estimates of *Macoma* quality, *ptilocnemis* requires 15.4–21.4 h d^{-1} of foraging time in the upper Cook Inlet in January. This range exceeds the maximum daily duration of mudflat availability in this region (~18 h). *Ptilocnemis* likely maximizes access to foraging sites by following the exposure of ice-free mudflats across the upper Cook Inlet region, and selects smaller, higher quality *Macoma* to minimize foraging times. Ultimately, however, this unusual non-breeding ecology is enabled by the unusually high quality of their *Macoma* prey resources. Ironically, potential metabolic benefits incurred by Rock Sandpipers due to future climate warming may be offset by climate-mediated decreases in prey quality.

Combined effects of salinity and temperature on the physiology of two Red Knot subspecies with contrasting non-breeding life histories

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Many migratory shorebirds inhabit environments with contrasting salinities and temperatures and thus their osmoregulatory demands might vary widely, even within a given species. In the Red Knot *Calidris canutus*, birds of the nominate subspecies winter in tropical intertidal areas where they are subjected to high salinities and temperatures, whilst birds of the *islandica* subspecies winter in north-temperate regions where they experience relatively low salinities and temperatures. We acclimated Red Knots of these two subspecies to different salinity (28 and 40‰) and temperature (5 and 35ºC) combinations for 2-week periods and then measured a suite of physiological, morphological and blood parameters. Overall the best fitting models to explain variation in the parameters measured were those which included salinity and temperature. However, overall *canutus* and *islandica* knots responded similarly to the different treatments, which indicates that variation in the measured parameters is mostly explained by phenotypic flexibility. Warm-acclimated birds under high salinity conditions exhibited lower BMR, body mass, food intake, gizzard mass and fat stores, showing that salt intake and heat load constrained food and energy acquisition rates. Regardless of temperature, salt-gland scores were higher under high-salinity treatments, suggesting that the size of the salt-glands had reached a maximum after two weeks of acclimation to high-salinity conditions. A higher level of plasma Na+ in birds exposed to heat and high-salinity conditions indicated that the combination of salt and heat loads might have a direct negative effect on the water-salt balance of Red Knots. Our results indicate that salinity and temperature substantially affect a suite of physiological, morphological and blood parameters in a long-distance migrant shorebird and highlight the importance of considering these abiotic factors jointly rather than separately when evaluating the physiological tolerances of shorebirds.

The bill tip organ of the Spoon-billed Sandpiper and some other sandpipers

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We studied the structure of the bill tip organ of Spoon-billed Sandpiper *Eurynorhynchus pygmeus* (SBS), Western Sandpiper *Calidris mauri* (WS), Semipalmated Sandpiper *Calidris pusilla* (SS), and Red-necked Stint *Calidris ruficollus* (RNS). We examined the surface of the bill in all four species and for three species (SBS, WS & RNS) we investigated the longitudinal and transverse histological sections.

In the SBS the pits are situated on the bill surfaces in a narrow area along the bill tip. The width of this area is only 1.5 mm (3 mm in the centre) compared to 7 mm in the other species we examined. We can therefore assume that, compared with other sandpipers, the SBS is specialized in prey detection in the thin top layer of the substrate. In addition the diameter of the front pits in this species is the largest and their depth is the smallest and, hence, the number of layers of Herbst corpuscle in the individual front pits is the smallest. The holes in the middle and rear pits in the mandible of the RNS are smaller than in the mandibles of the WS and SS, but the pits in the WS are deeper. We found that in three species (SBS, WS & RNS) the maxillary pits are larger than the pits in the mandibles. This disproves Bolze's (1968) hypothesis that the impact of increased loading on the wall of individual pits (the diameter of this pit is larger, so the number of pit walls is smaller) is mitigated due to the mandible's solidity. The central pits of the SBS are the largest and the front pits of the WS are larger than the middle pits. This could be due to the need for most prey detection by the signals from the front pits and distinguishing the prey's signals from the noise of running water. We suppose that the species that take food from the water have the largest pits. This could be due to a decrease in the load on the bill, a decrease of the vibration intensity in liquid and feeding on smaller prey (extraction of small prey from a solid substrate is more difficult). On the whole, our results support the hypothesis about specialization of SBS and, to a smaller degree, of WS and SS in feeding from liquid and semi-liquid substrates. The RNS feeds from more solid substrates.

Small variations on a grand theme: the migration of the Great Snipe *Gallinago media*

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The migration details of the Great Snipe *Gallinago media* were for a long time poorly known. Three tracks from geolocators in 2010 (Klaassen *et al.* 2011 – Biol. Lett. 7:833–835) revealed a remarkable migratory behaviour. The birds made very long and fast non-stop flights to their central African winter quarters, and surprisingly, they also overflew wide areas of seemingly suitable habitats. After a few more field seasons there are now data for about 20 individuals, which confirm the results from the first tracks as well as giving much more detail. Some birds make a short stopover in N Europe in autumn, but most birds embark on a trans-Saharan flight of 5,000-6,000 km directly from the breeding grounds. The average ground speed of the direct flights was 25 m s^{-1} (90 km h^{-1}). At least one bird carried out the complete 7,000 km migration in one flight. The winter sites were concentrated in an area around the equator, ranging 5°S–2°N and 14–19°E. The birds stayed in their winter quarters for about seven months and generally did not show any detectable change in location during winter. Spring migration started with a non-stop flight of 5,000 km, followed by many short flights through central Europe. All birds arrived at their breeding quarters within a few days in mid-May. The peculiarities of these great flights are discussed.

Geolocators reveal migration and wintering ecology of the southern Dunlin *Calidris alpina schinzii*

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Information about migration routes and wintering sites are important for the conservation of waders. Such information can be reliably gained with the use of geolocators. In 2013, we mounted geolocators on southern Dunlin breeding in Finland using leg-flags. These birds were successfully recaptured in 2014. The study was conducted within a long term study involving colour-ringing of all individuals. This also allowed us to effectively test effects on life history. We show preliminary results on timing of migration, timing of breeding, migration routes and wintering sites. The data suggest that the main wintering sites are located in W Africa and that the most important staging area is the Wadden Sea. We found no evidence that geolocators affected survival or breeding success.

Ranging behaviour of Great Snipe males in E Europe - GPS telemetry results.

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In 2012 and 2013, we equipped 30 male Great Snipes caught at breeding grounds in the Upper Narew and Upper Biebrza river valleys of NE Poland with GPS-loggers. Birds were caught at 2 leks in 2013 and at 4 leks in 2014. Data were obtained from 7 males in 2013 (mean 248 fixes/bird) and 20 males in 2014 (mean 123 fixes/bird). The tracking period varied from 2 to 24 days in 2013 (mean 14 days) and from 4 to 52 days in 2014 (mean 21 days), depending on the date of deployment, battery capacity, solar charging efficiency and bird behaviour. We attempted to maintain a constant 1h or 4h interval between successive fixes, occasionally longer due to lack of sun and failure of solar charging. A preliminary analysis included only good quality data, i.e. series of continuous fixes lasting for a minimum of 10 days or intermittent series with at least 50 fixes. Based on these data, we can identify 3 groups of males showing different patterns of within-season dispersal between leks. Males of the first group (n=7) showed strong fidelity to a single lekking site and visited foraging sites close to the lek (up to 1 km). The second group consisted of males (n=8) that attended mainly a single lek but occasionally visited adjacent leks located up to 3 km from the first one. The third group of males (n=6) showed low site-fidelity and some visited up to 4 leks during the tracking period (and up to 3 leks in a single night). Birds of this group travelled up to 70 km between successive lek visits. The different patterns of ranging behaviour we found in our study may represent alternative mating strategies employed by different individuals or conditional strategies depending on some factors still to be identified. Relatively frequent switching of leks should be taken into account when designing and interpreting Great Snipe surveys.

At what scale does anti-predation grouping facilitate association in Redshanks?

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In animals which tend to form long-term groups, established interactions can subsequently facilitate evolution of more complex social behaviour. The question is how strongly are such associations affected by grouping on different spatial scales. We measured the relationship between association and grouping behaviour in Redshanks to test the scale at which shared anti-predation behaviour increases association. In terms of the coarse scale of anti-predation behaviour, Redshanks occurred either alone or in flock while in terms of fine scale, they were either at the edge or in the centre of the flock. There was consistent individual variation in anti-predation behaviour on both coarse and fine scale, and we also established clear groups of individuals that associate together. Although tendency to form groups inevitably correlated with degree of association, and tendency to form a group correlated with proportion of time in the centre of a group, suggesting biological relevance of all measures, there was no correlation between risk due to group position and degree of association. This suggests the scale of association due to shared anti-predation needs operates at the scale of forming a group (100s of meters), but then breaks down within groups (10s of meters). Associations maintained within groups must then be driven by either additional shared requirements operating at a smaller scale such as competitive foraging ability and/or individuals preferentially associating with other individuals dependent on their identity.

Assessing the potential for conflict between wintering birds and recreational activities in Poole Harbour, UK

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In this talk I will present the results of a study to investigate the types and frequencies of disturbance activities in Poole Harbour, UK; there is a clear difference in the frequency of activities between sub-sites, as well as in the distribution of activities across the intertidal area. This could have consequences for the birds feeding in those habitats. As well as being popular for recreational activities, Europe's estuaries provide essential non-breeding habitat for many species of waterbird, which take advantage of the abundant food availability in intertidal areas. So disturbance, whether anthropogenic or natural, has the potential to affect birds' ability to feed sufficiently to meet their energy requirements for survival to the end of the winter and to achieve body condition for migration and breeding. On many sites, conservation managers therefore take steps to minimise the impacts of disturbance by regulating human activities. In order to be successful, such regulation needs to be informed by knowledge of the types of activities that are occurring, their spatial and temporal distributions, and the varying responses of birds to those activities. For example, wildfowling (hunting) in Poole Harbour disturbs birds over a greater area but they resume feeding sooner, and the activity is relatively infrequent compared to disturbances by walkers. By comparing the relative potential impacts of different activities (in particular hunting and walking) using an index of disturbance that takes account of both frequency and magnitude of disturbance, I will discuss how the results of this study can be used for the protection of the nationally and internationally important bird assemblages in Poole Harbour and on other sites.

Quantifying the pressures placed on wading birds by environmental change and the role of predictive modelling

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Habitats like estuaries that are vital foraging areas for wading birds are coming under increased pressure from environmental change. Using evidence from the current literature, we have drawn together different types of changes that have or are currently affecting wading birds and created gradients of the effects on their populations. Where knowledge gaps are identified in these gradients we used predictive models to assist in addressing them. The environmental changes investigated are divided into those affecting the physical environments of waders and those affecting their behaviours. Physical changes we look at include shifts in foraging habitat size, the impacts of fisheries and changes in ambient temperature, sea level and pollution. Alterations in these influence waders through interference competition, changing prey-size and communities, shifts in energy requirements, reductions in foraging opportunities and bioaccumulation of toxins. Disturbance from anthropogenic causes is the principle behavioural effect investigated where increased energy costs result from flushing and reduced foraging time. Behaviours arising indirectly from physical environmental changes are also considered (such as alterations in arrival and departure times compared to peak prey abundances). Further focus is applied to the key characteristics of birds that are affected by environmental change – their daily energy demands and foraging habits. The physical and behavioural environmental changes described above are considered in terms of how they impact on each species within these two areas. Presenting the collated results from the literature on a gradient allows for detailed analysis of the variation in survival between different species and environmental change scenarios. Ranking and identifying the environmental changes which occur most often and those that rapidly shift populations over a survival threshold will be vital in focusing conservation management efforts.

Climate change is only half the problem: agricultural management inhibits the ability of Black-tailed Godwits to respond to climate change

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The advancement of spring phenology in response to global climate change has resulted in broad-scale selection for early breeding in birds. Some populations have been able to respond to these selection pressures and advance their lay dates, while others have not, resulting in population declines. Much effort has gone into determining those factors that affect a population's ability to respond to advancing spring phenology, especially the reliability and predictability of the cues related to the timing of breeding. Other factors may play a role as well, however, including those posed by other anthropogenic changes. Continental Black-tailed Godwits *Limosa limosa limosa* have been unable to respond to climatic changes and this has been hypothesized to contribute to their recent decline.

We used a combination of spring habitat phenology, breeding success, and recruitment data from a large marked Black-tailed Godwit population to determine which factors may be constraining godwits from advancing their lay dates. We found that a complex relationship between godwits breeding in different agricultural environments has constrained their timing of breeding. Herb-rich meadows account for the majority of individuals that have been recruited into the population, while intensively managed agricultural meadows have produced only a small proportion of recruits despite comprising much of the landscape. Concomitantly, godwits breeding in herb-rich meadows experience stabilizing selection as a result of higher rates of depredation on early nests and an extended peak of insect abundance, while godwits breeding in intensively managed meadows experience no directional selection because of extremely high rates of nest-failure and brood-loss. Thus, at the landscape scale, despite a rapid advancement in spring phenology, no selection regime for earlier breeding exists. This suggests that for populations breeding in human-mediated landscapes, other anthropogenic selection pressures may outweigh those imposed by climate change.

Metapopulation dynamics of Black-tailed Godwits in a fragmented agricultural landscape

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Understanding the underlying population dynamics of threatened species is critical for making decisions regarding conservation. Some populations can only persist when there is immigration (sinks) from populations where reproduction is higher than mortality (sources).When occupied habitat differs in quality, studying source-sink dynamics is a logical next step. But, collecting enough data to come up with sound estimates of population demographics is challenging, as individuals should be followed in multiple years and in different locations. By following individuals it is possible to not only estimate key vital rates, such as survival and reproduction, but also dispersal rates between subpopulations in different locations. In our study we have followed individuals of the threatened Black-tailed Godwit (*Limosa limosa limosa*) for multiple years in a landscape mosaic of traditional meadows and modern grassland monocultures. We show that monocultures act indeed as sinks and meadows as sources. Moreover, we show that although meadows are favoured over monocultures, the presence of monocultures prevents recovery of godwits on meadow habitat.

Land abandonment and polarization of agriculture – what are the challenges for waders?

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Abandonment of farmland in the Moscow region (56°45'N, 37°45'E), Russia, resulted in an increase of abandoned land at the main study plot (48km^2) from 5% in 1994 to 74% in 2010. With agricultural rehabilitation in 2011, some grassland was turned into arable fields, which resulted in a polarization of agriculture in the region because vast areas are still abandoned. Habitat changes caused changes in the spatial distribution of Eurasian Curlew *Numenius arquata* and the growth of its nesting density in a reduced area of grassland used for haymaking (from 0.4 to 1.95 pair/km^2). In the 2000s, the nesting densities of Black-tailed Godwits *Limosa limosa* and Northern Lapwings *Vanellus vanellus* increased in fields with sparse vegetation (stubble, winter crops, first-year sown grass) compared with the 1990s (Rs=0.77, p=0.002 & Rs=0.74, p=0.006, respectively). The density of lapwings increased in tillage without vegetation (Rs=0.73, p=0.007). The increases in the densities of lapwings and godwits was best explained by the increase in the proportion of abandoned land (AIC in GLM). Hatching success increased in 1997, 1999, 2005 in curlews from 32 to 97% and in godwits from 15 to 91% due to better nest concealment on abandoned land and the growth of wader density on cultivated land. Long-term land abandonment reduces the suitability of grassland for waders: in 2012 on 350km^2 of mostly still abandoned farmland, 77% of curlews, 98% of godwits, 87.5% of Common Redshanks *Tringa totanus*, 75% of Marsh Sandpipers *T. stagnatilis* settled on cultivated land. After agricultural rehabilitation had started 75% of lapwings at the main study plot moved to 450ha of newly-ploughed fields for nesting. Godwits (5–9 pairs) and curlews (2–4 pairs) continued to breed on these former grasslands, but nest survival there was very low in 2 of 3 years. Great Snipe *Gallinago media* began breeding on little-used meadows on the floodplains and continued to display at leks that have been ploughed in recent years. Thus, during the agricultural recession, waders have shown a preference for cultivated rather than abandoned land.

Trends of wader populations in the flood plains of Central Russia resulting from changes in land-use and spring floods

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The flood plains of Central Russia play an important role for breeding wader populations. Until the late 1980s they had been used for non-intensive traditional agriculture, but then began a deep farming depression which is still continuing. This has led to the loss of wader habitats due to overgrowth by tall weeds and bushes and severe spring fires. The level and duration of spring floods is a major natural factor, which can either enhance or ameliorate the effect of the farming depression. The influence and interaction between these factors on populations of 10 wader species was studied in two key floodplain areas with various conditions: Vinogradovo (Moscow Region) and Ilmen Lake (Novgorod Region).

During 1985-2014, in meadows that had been totally abandoned at Vinogradovo, catastrophic declines were recorded for *Philomachus pugnax* (from ca. 100 breeding females to 2-5 females breeding occasionally) and *Limosa limosa* (from 100-120 pairs to 12-25 pairs). Compared with these losses numbers of *Gallinago media* have been stable and those of *Gallinago gallinago* have grown. Numbers of breeding *Vanellus vanellus* and *Tringa stagnatilis* have fluctuated, increasing in years with extensive flooding, which partly compensates the loss of habitats. Similarly, flooding has led to the appearance of new leks of *G. media* and nesting of *Philomachus pugnax*.

In the Ilmen study area, the intensity of farming underwent a major decline during 1991-2007, but the way the area flooded and the burning of dry vegetation in early spring prevented wide-scale loss of wader habitats. Here there was a growth in the numbers of *Vanellus vanellus*, *Limosa limosa* and *Numenius arquata*, but breeding *Philomachus pugnax* showed strong fluctuations, depending on the spring floods. The threatened *Calidris alpina schinzii* is the only wader that has benefited in years with very low levels of spring flooding, when short-grass lake-shore habitats appear at Ilmen. The trends of the wader populations of the Central Russian floodplains as a whole and their prognosis are discussed.

Disease reveals the predator: the interplay between canine disease outbreaks, red fox and meadow bird populations in Denmark

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There is a large amount of literature dealing with the breeding success of meadow-bird populations in Europe that has been studied under a variety of predator communities and predation pressures. Most studies identify the red fox as a major and often the most important predator. Although there is increasing evidence that foxes can have major impacts on populations of meadow-birds, it has usually been obtained by combining local datasets on e.g. wader productivity with modelling approaches involving mortality estimates from wader populations elsewhere in combination with (gu)estimates of fox populations, because fox monitoring data hardly exist in most study areas.

In Denmark, fox populations have been monitored since 1949 through mandatory bag statistics from hunters, and meadow-bird populations since the mid-1970s in a couple of nationally important sites. Outbreaks of canine diseases, e.g. rabies, scabies (sarcoptic mange) and distemper have occasionally had major impacts on fox populations resulting in population declines of 50-80%. Northern Lapwing productivity has likewise varied a lot, with hatching successes being usually <25% in high fox density years and >50% in low density (disease outbreak) years. Although many other factors also contribute to variations in meadow-bird population, we conclude by demonstrating by time-series analysis that the fox population fluctuations are the major explanatory variable for several species of waders breeding in Danish wetlands.

Diet of four wader species at Banc d'Arguin, Mauritania, based on faecal and stable isotope analyses.

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Banc d'Arguin is the most important wintering area for waders in the East Atlantic Flyway. Despite many years of wader studies in the area, detailed information on the diet of waders is only available for few species, particularly Red Knot *Calidris canutus*.

In the winter 2012-2013, we collected samples of faeces, potential food items and bird toenails, in order to compare wader diets assessed by two methods: faecal and stable isotope analyses. Prey remains in faecal samples were identified, while the prey organisms collected were used to calculate regression equations to allow the estimation of the size and biomass of prey consumed based on the size of remains found in the faeces. Bird toenail and whole prey samples were analysed to determine δ13C and δ15N values, and these data were modelled in Bayesian stable isotope mixing models to estimate the presence and proportional relevance of each prey in wader diets.

Both analyses suggest that the diets of Sanderling *C. alba*, Dunlin *C. alpina* and Ringed Plover *Charadrius hiaticula* are mostly composed of gastropods, polychaetes and crustaceans. However, the relative importance of each prey type is not consistent between the two analyses. Also, the large proportion of Dunlin faeces with no identifiable food items suggests there may be an important soft bodied prey that was not detected in either analysis. Stable isotope mixing models were unable to exclude any potential prey from the dies of Red Knots, possibly because of the large isotopic niche exhibited by this wader. The faecal analysis confirms the importance of the bivalves *Dosinia isocardia* and *Loripes lucinalis* for knots, but also suggests that gastropods form a significant proportion of their diet. Stable isotope data suggest that all four species consume *Zostera* rhizomes; plant fragments found in faeces may confirm that this is the case. There was no evidence for biofilm consumption.

Shorebird distribution depending on predictability of trophic resources. Study case: Yves Bay, Bay of Biscay, October 2010

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Shorebirds are long-distance migrants, and their distribution over European sites with intertidal mudflats varies from year to year. Various factors have been shown to influence their site-selection, including weather conditions (e.g. wind and temperature), mudflat habitat quality (e.g. anthropic pressure and trophic resources) and prey availability and quality.

The study case of Yves Bay (Pertuis-Charentais, France) highlighted links between habitat characteristics (i.e. in that case grain size), habitat quality (the spatial distribution of benthic species) and the composition of the bird assemblage foraging at the location. In Oct 2010, 252 stations were sampled on a predetermined 250 m regular grid covering the intertidal mudflats of this major French site for wintering shorebirds. The distribution of all benthic biomass was described for the entire bay. Additionally, within each 500 m grid square, a sediment sample was collected. Median grain size, as well as the silt fraction (< 63µm) was interpolated for all sampling stations, and showed a peculiar north-south granulometric gradient. The influence of grain size on the density, biomass and assemblage of macrobenthic prey species was studied.

The final objective was to compare bird counts and shorebird distribution on the mudflat with prey species distribution in order to test if estimates of carrying capacity can predict the community structure and abundance of shorebirds during the wintering period.

This broad overview of an intertidal ecosystem illustrates interactions between a physical gradient i.e. grain size, and two biological trophic levels through their spatial distribution. The study of the Yves bay ecosystem is an opportunity to question the suitability of meta-indicators —grain size, benthic densities and distribution — as well as another conservation tool: estimates of carrying capacity.

Sharing the Margins: Populations and conservation status of New Zealand shorebirds

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Twenty-seven taxa of Charadriiformes breed in New Zealand and its offshore islands (excluding the Kermadecs) of which 20 are endemic. Under current threat rankings seven taxa are classified as Nationally Critical, one as Nationally Endangered, seven as Nationally Vulnerable, and four as At Risk: Declining. Only one taxa is classed as Recovering while two are Not Threatened. A further five taxa, confined to offshore islands, are classified as Naturally Uncommon. Up to 15 species of Arctic migrants occur annually in New Zealand, three of them in internationally important numbers. Two of these Bar-tailed Godwit *Limosa lapponica baueri* and Red Knot *Calidris canutus* were recently reclassified as being native to New Zealand and given a threat ranking, one as Nationally Vulnerable and one as Declining. Population trends for the third taxa, Ruddy Turnstone *Arenaria interpres* indicate it should be reclassified as Nationally Vulnerable as well. A review of the population and conservation status for each taxa is given. Habitat loss or degradation is a common thread, but the most potent threat for NZ breeding shorebirds comes from introduced mammalian predators. For migratory species habitat loss in East Asia appears the primary driver of population declines.

Dublin Bay birds: monitoring, marking and tracking waterbirds in an Irish estuary

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Dublin Bay is an internationally important site for waterbirds and is designated as a Special Protection Area under the EU Birds Directive. In excess of 30,000 migrant wintering waterbirds are frequently recorded in the bay, and the site has ranked in the top 10 most important sites in Ireland since national-scale monitoring began during the late 1960s. In Jan 2013, the Dublin Port Company funded a 3.5-year programme of work, which aims to describe spatial and temporal patterns of usage of Dublin Bay by waterbirds. The work consists of an intensive programme of counts and observations of all waterbirds, and colour-ringing and radio-tracking of waders. Marked birds will help to identify important feeding and roosting areas for waders, and to assess the extent of movement throughout the winter. This will improve our interpretation of the potential impacts of disturbance on wintering waterbirds and will help to inform decisions regarding developmental activities in Dublin Bay. High and low tide waterbird counts have been conducted on a bi-monthly basis for a twelve month period and will continue until 2016. A total of 1,825 waders were ringed between Feb 2013 and Feb 2014. Oystercatchers (151), Redshanks (19) and Bar-tailed Godwits (99) were colour-ringed and have generated in excess of 800 re-sightings. To date, the majority of the re-sightings (97%) have come from within Dublin Bay, but re-sighting reports from Scotland (6 Oystercatchers), Norway (1 Oystercatcher, 1 Bar-tailed Godwit) and Iceland (3 Oystercatchers, 1 Redshank) have been received. VHF radio transmitters were fitted to four Oystercatchers, three Redshanks and four Bar-tailed Godwits in Jan 2014. The radio-tagged birds were searched for in 51 diurnal and nocturnal sessions, between February and April, over both low and high tide periods.

Governance and management for ecological sustainability: avian predation on waders

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This presentation explores how the governance and management of wet meadows influences waders. Predation on nests and young is proposed as one contributor to the decline of breeding waders in Europe. We explored this hypothesis by comparing landscapes with different wader population trends and management status in S Sweden and E Europe. Specifically, we explored three predictions linked to the predation of waders: (1) the relative abundance of avian predators and waders at the patch level, (2) avian predator abundance at the landscape scale, and (3) the predation rate on artificial wader nests, should all be higher in declining vs. stable populations. All predictions were supported. Nevertheless, predation may not be the ultimate factor causing wader population declines with the cumulative effects of landscape change linked to increased food resources for predators, reduced wet meadow patch size and quality. We argue in favour of holistic analyses of social-ecological systems at multiple scales and landscapes, including processes such as predation, other factors affecting waders, and how governance and management can be improved. Additionally, different approaches to landscape governance and management need to be examined to understand if and how wader populations can be managed and sustained for future generations.

A review of threats to Numeniini populations around the world

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Many Numeniini species around the world are under high threat, comprising small populations or declining rapidly. Most are strongly migratory, many occupy human-modified landscapes for some or all of their annual cycle and many are also susceptible to hunting. In an attempt to identify potential causes of these population declines, and to examine how they may vary between different flyways, and between breeding and non-breeding populations, a one-day workshop was held at the 2013 Wader Study Group Conference to focus on this issue. In advance of the workshop, a list of potential threats based upon the Salafsky *et al.* (2008) lexicon was circulated to experts around the world. Experts were asked to score these threats by their importance for each biogeographical population that they had experience of. At the workshop, these responses were collated and assessed, in order to produce a final scoring. Subsequently attempts were made to fill knowledge-gaps that were identified at the workshop. In this talk, we present the first analyses of these threats from the workshop. First, we identify the direction of change in particular threats, and how those vary between species, flyways and breeding and non-breeding areas. This usefully highlights the major environmental changes that these populations have been subject to. Second, we identify the impact that each threat has had upon the populations of interest, we review which have been the most important, and identify how these threats vary between species, flyways and habitats. Thus we identify the key threats that this vulnerable group faces. Finally, knowledge-gaps are identified and potential next steps to support their conservation, are outlined.

40 years of change for British and Irish breeding waders: results from atlas projects

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Three distribution atlases have mapped the occurrence of breeding waders in Britain and Ireland from 1968–72 to 2008–11. Fine-scale occupancy data from the most recent atlas, and from the 1988–91 atlas also allow description of spatial abundance pattern and change. These data show significant range contractions and abundance declines for many wader species including Common Redshank and Eurasian Curlew. Some species, including Common Sandpiper, have undergone relatively minor range contractions but are showing significant abundance declines throughout their range. Few species show range expansions and abundance increases. We will review the evidence for changes at national and regional levels and consider likely causes of change.

The importance of Yalu Jiang Wetland National Nature Reserve for shorebirds during northward migration 1999–2010

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The 101,000ha Yalu Jiang Estuary Wetland National Nature Reserve extends 60km westwards from the North Korean border along the Chinese coast of the Yellow Sea. The reserve includes approximately 9,000ha of aquaculture ponds and mudflats that extend several km south from the seawall. The first shorebird survey in May 1999 found over 152,000 shorebirds of 26 species. A survey in late May 2000 found over 92,000 shorebirds. The Miranda Naturalists' Trust became involved in 2004 and surveys of the reserve continued annually in April or May until 2010. The findings were published in a report in March 2014. The results show the Yalu Jiang Reserve and a nearby river estuary supported at least 250,000 shorebirds annually on northward migration during the survey period. 41 species were recorded, of which 15 occurred annually or regularly in internationally important numbers, including Bar-tailed Godwit >90,000, Great Knot >55,000, Dunlin >45,000, Eurasian Curlew >13,000, Grey Plover >9,000, Eastern Curlew >6,000, Far Eastern Oystercatcher >1,000 and the critically endangered Spotted Greenshank 24. Over 1,000 banded and other marked shorebirds from 19 regions in 8 countries were identified in the region to 2010. The area is coming under threat from reclamation, industrial development, habitat loss and changed hydrology, which are likely to affect the number of shorebirds able to refuel at Yalu Jiang in the coming years.

Seasonal survival patterns in Red Knots *Calidris canutus islandica*

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By differential mortality, natural selection is constantly adjusting phenotypes to the environment. For systematically varying seasonal environments this adjustment always 'tries' to minimize mortality differences between seasons. Increase of mortality in some seasons will thus show where the natural selection pressure is high.

We analyze seasonal mortality in the *islandica* Red Knot, in a quasi-experimental setting. A period of intense food limitation on non-breeding grounds due to overfishing of shellfish stocks was followed by a relaxation period when stocks recovered. To obtain seasonal survival from our 15-year-long near-continuous capture-resight data, we introduce a 'rolling window' approach to parameter estimation for multiple overlapping seasonal intervals. During the period of food limitation, survival probability was lowest during the early non-breeding season (September mean apparent survival 0.75 y^{-1}) and highest in spring (March; 0.97). As predicted, during the relaxation period survival rate flattened to a minimum value in October (0.79) and a maximum in April (0.85).

Hot and warm: consequences of rising temperatures for breeding and beyond

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Responses to climate change have been widely reported across the natural world. Most refer to phenological changes but the consequences of these changes for populations are largely unknown. In order to improve our predictions of future climatic effects on populations, a mechanistic understanding of how phenological changes may impact demography and distribution is needed. The migratory Icelandic Black-tailed Godwits breeding in Iceland have experienced a warming trend in temperature in this sub-arctic region throughout the past century, when annual mean temperature at the longest running weather station rose by ~1.2°C. Concomitant with this warming, the Icelandic godwit population has increased and expanded throughout the country, colonizing new areas during each decade of the 20th century. Here we investigate how temperature can influence the timing of breeding season events (e.g. laying dates, incubation and chick rearing length) at the individual level. We then scale up to explore how timing of breeding season events can drive demographic parameters and how these can influence distribution changes (e.g. range expansion) at the population level. Our current understanding of the mechanistic links between climate-mediated phenological changes and potential cascading effects on population demography and distribution need much attention if predictions of species responses to climate change are to be improved.

Climate change effects on survival and reproduction in an Arctic migratory bird species

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The Arctic is the breeding habitat for 59 species of long-distance migratory shorebirds, the majority of which are rapidly declining. Conservationists need evidence-based judgements of how to prioritize conservation actions, which is complex due to the different environmental factors encountered throughout the annual cycle of migratory birds. Climate warming leads to unequally advanced phenology of organisms across trophic levels, resulting in phenological mismatches between predators and prey. Evidence for phenological mismatches in Arctic species is however scarce. During a 17-year period, a long-distance migratory shorebird (Sanderling) advanced its hatching date by only 2.3 days per decade while the emergence of its arthropod prey advanced by up to 30 days per decade, resulting in a strong phenological mismatch. Consequently, late-hatching chicks showed poorer growth and survival. Sanderlings are limited in their ability to advance breeding by environmental constraints during migration and by seasonal changes in nest-predation pressure. Within the Greenlandic population, it is probable that individuals wintering in tropical rather than temperate areas are especially affected. The annual survival of adult and juvenile Sanderlings in Africa has not changed during the past decade. We suggest that flyway population growth is limited mainly by climate effects acting on reproduction in the Arctic.

Conservative and opportunistic settlement strategies in Arctic-breeding shorebirds

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Shorebirds appear to have evolved a number of strategies for adapting to and exploiting the unpredictable and inhospitable Arctic environment. Two such strategies, put forth by Holmes (1966, 1971b) and Pitelka *et al.* (1974), suggest that species either conservatively or opportunistically select breeding locations based on local environmental conditions. "Conservative" species were characterized by strong site-fidelity and territoriality, consistent population densities, relatively even-spacing of individuals, and monogamous mating systems, while "opportunistic" species exhibited opposite traits and were polygamous.

Here, we present data to show whether 10 shorebird species consistently exhibited these settlement strategies over a 10-year period (2003–2012) near Barrow, Alaska, by comparing annual estimates of site-fidelity, territoriality, and population density. We also determined the relative importance of past and current environmental and social conditions in predicting annual breeding densities of these same species. Data from 1,413 captured adults and 1,946 shorebird nests indicated that most species conformed to one of the two settlement strategies, while others exhibited traits of both strategies, and a few had settlement patterns inconsistent with those predicted for their mating system.

We suggest that deviations from these strategies may occur depending on a species' location within its breeding range. For some species, however, described settlement patterns may be just too simplistic. In general, species with the same settlement strategy appeared to respond similarly to environmental cues. Nest densities of 4 of the 10 species were related to invertebrate biomass, lemming abundance, or overall nest survival rate. For a few species, we found higher nest densities when fox removal effort was low. Results from this study indicate that understanding how species settle may have important consequences for implementing monitoring or conservation actions.

The truly exploded lek: breeding site sampling by male Pectoral Sandpipers

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Males of lekking species display in aggregations where female choice and male-male competition are intense. Reproductive skew is often high among males on a given lek. However, understanding the consequences of lekking for sexual selection, population dynamics, local adaptation and migration strategies has been hampered by the lack of information on the spatial scale at which males compete.

Here we show that after having arrived at Barrow, Alaska, a known breeding location, individual male Pectoral Sandpipers *Calidris melanotos* sampled up to 14 other potential breeding areas within a three-week period in June, travelling total distances within the Arctic of up to 15,000 km. Individual males thereby covered a considerable part of the entire species' breeding range within a single season, after having migrated from the southern hemisphere. The number of days each male spent at these sites was comparable to that found on the breeding grounds in Barrow, Alaska. We discuss the consequences of these results for sexual selection and population dynamics.

Abstracts of posters

Results of Ringed Plover *Charadrius hiaticula* ringing in the Gulf of Gdańsk (southern Baltic, Poland) using metal and colour rings

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Since 1983, WRG KULING has been marking Ringed Plovers at different sites in the western part of the Gulf of Gdańsk during autumn migration. Standard stainless steel rings were used. From 2012 onwards, an engraved plastic ring (green with white inscription, one letter and two numbers) was placed on the right tarsus. In total 1,411 birds were marked with only a metal ring and 268 with both metal and plastic rings. Analysis of ringing recoveries shows that two subspecies (*hiaticula* and *tundrae*) use the Gulf of Gdańsk as a stopover site. After departure from the ringing area most birds follow the Baltic and North Sea coasts, but some of them migrate over land towards their wintering sites. The recovery rate of individuals recorded > 30 km away from the ringing site marked exclusively with metal rings was much lower than in those with colour rings (0.7% and 3.5%, respectively). However, colour rings were only put on Ringed Plovers in the last two seasons. We assume that the recovery rate will increase in subsequent years, because, for example the recovery rate of colour-ringed Dunlins exceeded 5% after the programme had been running for four years.

* * *

Detecting spatial structures in shorebird populations from mark-resighting data

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We presented a metric, which expands the concept of site-fidelity, to detect the existence of spatial structuring in populations. We first simulated data to test the

robustness of this metric to different sampling sizes. We then applied this metric to mark-resighting data of three shorebird species collected at roosts in a key wintering site, Roebuck Bay, NW Australia, from 2009 to 2014. Despite varying roost availabilities within the year, we detected preferences for a range of roosts which were different between individuals, and consistent between years. This fine-scale space-use preference occurred within an individual's wintering home range, and generated spatial sub-populations.

* * *

Increased predation pressures on breeding meadow-birds calls for delayed release and lower densities of cattle and other grazers

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Meadow-bird populations in Denmark have been declining over the past 40 years as in most other European countries. At the same time there is quite good evidence that predator populations have been increasing due to reduced persecution (i.e. lower hunting pressure), and reduced pesticide and non-pesticide chlorinated hydrocarbon contamination. Elsewhere we will document that the increasing predator (especially red fox and raptor) populations are likely to have contributed to the declines in productivity of the meadow-birds and their population declines. Another mortality factor affecting meadow-birds comes from cattle, sheep and horse grazing, because these may trample nests if they are released into the meadows when nests are active. By combining data on Northern Lapwing nesting success in low and high predation pressure years (caused by outbreaks of diseases resulting in low fox densities) with experimental tests of impacts of low and high densities of cattle, we demonstrate how the overlap between breeding lapwings with grazing cattle are increasing under high predation pressures and high cattle densities – and use these findings to advocate for best practice regarding cattle management of meadows under high predation pressure regimes.

History, current status and conservation problems of the Iberian population of the Eurasian Curlew *Numenius arquata*

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The Eurasian Curlew *Numenius arquata* reaches the southern edge of its European breeding range in the Iberian peninsula. There are references from the early twentieth century to the species breeding in Spain, while in Portugal there is no record of current or past breeding. Since 1970, the Spanish population has been restricted to Galicia in the northwest, where the number of breeding pairs has ranged between two and five. We have been studied this population since 2007. In 2014 the breeding population consisted of five pairs located in an area of 300 ha of heathland, with *Erica* and *Calluna* patches alternating with *Ulex*. This site is surrounded by meadows used as feeding area for the curlews. The breeding density in 2014 was 0.17 pairs/10 ha. In the last seven years, the average apparent hatching success (number of nests with at least one egg hatched as a percentage of the total number of nests) was 61.2% and the average productivity was 0.20 ± 0.10 fledglings / pair. In this communication we analyze historical data about the Spanish breeding population, we describe its current status and we enumerate its main conservation problems. Also we present the preliminary results of a program to protect nests with electric fences conducted in spring 2014.

* * *

The most important estuaries of western Kamchatka for wader migration

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During southward migration various species of waders spend long periods using mudflats as migration feeding areas. Most of the vast mudflats on the west coast of Kamchatka are associated with estuaries. The largest of these, which are important wader stopovers, are the estuaries of the Penzhina-Talovka and Khairusovo-Belogolovaya rivers. The latter was only explored for waders for the first time in 2010. Therefore a comprehensive assessment of all mudflats on the west coast of Kamchatka to detect other potentially suitable mudflats for waders is a key priority.

Mudflats and sandflats are easily detected on satellite images taken during low tide. For our work, we used satellite images from Landsat 7 and Landsat 8. These have rather high resolution (30 m per pixel) and sufficient channels for colour synthesis. We used channels 1 (Blue), 4 (NIR 1) and 5 (SWIR 2) for Landsat 7 and the similar channels 6, 5 and 2 for Landsat 8. It is also important for us that the coverage area of these satellites includes the whole of the Kamchatka peninsula and that there is rather large archive available for free on the http://www.usgs.gov/. To process the images we used programs Scanex Image Processor 4.0 and Mapinfo 8.0. The largest mudflats on the west coast of Kamchatka are in the estuaries of the Khairusovo-Belogolovaya (43 km^2), Penzhina-Talovka (36 km^2), Moroshechnaya (14 km^2), Tigil (9.2 km^2), and Voyampolka (6 km^2). There are also several lagoons in the southern part of the western coast that are potentially suitable for waders. The topography and structure of the mudflats in the Khairusovo-Belogolovaya and Moroshechnaya estuaries are not constant. They are dynamic and this can easily be seen in the satellite images from year to year. This dynamism requires study to determine the stability of these habitats and their impact on bird migration. Moreover it is necessary to consider the possibility of designating parts of these estuaries as Specially Protected Natural Areas.

* * *

Number and distribution of breeding Common Sandpiper *Actitis hypoleucos* in the Middle Vistula, Poland

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The Middle Vistula is a 160 km long part of the largest river in Poland. It is still moderately regulated, and consists of sections that are characterized by well-preserved natural habitats. It is an Important Bird Area (IBA PL083) and a Special Protection Area (PLB 14004). The fieldwork was carried out in April and May 2014 and covered an 11-km length of the river within two neighbouring nature reserves. In total 37 breeding territories and 10 nests were found. The mean breeding density was 3.5 pairs/ km of river and varied from 1.0 to 6.0 pairs/ km in different river sections. This is the highest mean density ever recorded in Poland and one of the highest maximum densities ever recorded. The maximal density was found on a 450 m long island, where 4 pairs were breeding, with a minimum distance of 85 m between the two nearest nests. Birds bred both on the islands (42%; N=13) and on the river shore (58%; N=18). Out of ten nests that were found, three were situated on flat terrain, one on undulating terrain and six on the slopes. Nine nests were found in vegetation or under willow branches, while only one nest was not covered by vegetation at all.

Morphofunctional Analysis of the Feeding Apparatus in the Spoon-billed Sandpiper *Eurynorhynchus pygmeus* (Charadriiformes, Calidridinae)

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An understanding of species feeding adaptations is essential for designing suitable conservation measures and this is impossible without a knowledge of the functional morphology of the feeding apparatus. We studied the critical-endangered Spoon-billed Sandpiper (SBS) and some other Calidridinae (16 species) and Tringinae (10 species) sandpipers for comparison. Distal rhynchokinesis, absence of an external jugomandibular ligament, flat orientation of the occipitomandibular ligament, a well-developed bill-tip organ and moderate development of bill-opening muscles are the characteristic of Calidridinae. These features provide an ability to feed on prey which are deeply and strongly fixed in a rather soft substrate. Weak aponeurosis of the dorsal adductors contributes to the ability to open the bill widely which might be advantageous for pecking surface-moving invertebrates. Well developed m. hypoglossus and m. branchiomandibularis pars caudalis in conjunction with massive salivary glands and numerous papillae on the palatal surface enable the tongue to transport food items with low inertia into the oesophagus (Burton, 1974; Korzoun, 1978). The broad spatulate bill of SBS restricts its ability for probing, especially in mossy sod. But other morphological features of SBS show close similarity to that of the other Calidridinae that we examined. At the same time, SBS has the most massive tongue. There are also the most numerous palatine papillae that reach the bill tip in this species. This implies the ability of the tongue to be strongly pressed to the palate across its whole surface and to act as a piston, which is able to protract against strong resistance. Tactile receptor pits on the external surface of the spatula are distributed only along the front periphery. These characteristics lead us to propose the presence of a specific mechanism for sucking and further filtration of the mud containing food items in the bird's bill cavity. This mechanism works due to concerted pro-retraction of the upper spatula and longitudinal motions of the tongue. The upper spatula rises and the tongue retracts and mud with prey is sucked into the bill cavity. During tongue protraction (and the lowering of the upper spatula) water with substrate particles is thrown away from the bill cavity while food objects are held by the palate papillae. During tongue retraction in the next cycle, prey is dragged to the oesophagus entrance. We assume that the separation of food items occurs in this way while the bird is dabbling, which is a characteristic feeding method of SBS (and some other waders).

Breeding waders decline on the Pripyat floodplain, S Belarus

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The Pripyat floodplain supports significant breeding populations of waders commonly associated with lowland grasslands such as Northern Lapwing *Vanellus vanellus*, Redshank *Tringa totanus*, Black-tailed Godwit *Limosa limosa*, and Great Snipe *Gallinago media*. More than 70% of the Belarusian population of Common Ringed Plover *Charadrius hiaticula* and Terek Sandpiper *Xenus cinereus* breed on the flooded meadows of the Pripyat.

In 2008, we started monitoring breeding waders on meadows in the middle of the Pripyat floodplain. We recorded all wader nests and birds with breeding behavior in a 140 ha study area near Turov town, Gomel Region (52.04°N, 27.44°E).

The total numbers of the 13 breeding wader species recorded decreased significantly (R^2=0.55, p<0.05). Similarly three individual species had negative population trends: Northern Lapwing (R^2=0.49, p=0.08), Common Ringed Plover (R^2=0.86, p=0.0025) and Redshank (R^2=0.62, p=0.03).

The overgrowing of open meadows with willow bushes is the main reason for the decline in waders. Disturbance during spring hunting and recreational pressure also have negative impacts on the wader population.

In 2006-2007, we started to take conservation actions (cutting of willow bushes and hay making) near Turov town in collaboration with APB-BirdLife Belarus. In 2008, the first Great Snipe leks were recorded there, and in 2014 we counted 40-50 lekking males in our study area.

* * *

Avian influenza virus serological surveys on spring staging shorebirds in Iceland

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Shorebirds are a primary reservoir of avian influenza viruses (AIV). However, the overwhelming documentation of avian influenza virus in shorebirds comes from surveillance studies conducted at a single location, Delaware Bay on the Atlantic coast of the US. Even at Delaware Bay, the majority of AIV detection occurs primarily in one species, Ruddy Turnstone Arenaria interpres. Very few AIV infections have been documented in shorebird populations at locations or times other than Delaware Bay in spring, despite significant surveillance efforts. However, recent virological and serological surveys of shorebirds at other locations showed that populations of shorebirds have high prevalence of antibodies to AIV despite no detection of AIV infections. These findings indicate significant virus exposure histories at times or locations other than where they were sampled.

Iceland represents an important stopover location for thousands of migrant birds in the East Atlantic flyway as they travel between their breeding grounds in Greenland and NE Canada and their wintering areas in Europe and Africa (Branson et al. 1978). We conducted surveillance studies in stopover shorebird populations in Iceland. We found high serological evidence of AIV exposure in Ruddy Turnstones (75%) which is similar to studies at Delaware Bay (64% in 2007/2008 and 55% in 2010).

It appears that Ruddy Turnstone, the dominant species at Delaware Bay in terms of AIV infection rates and seroprevalence, is also the serologically dominant species in Iceland.

* * *

Tracking day and night provides insights into the importance of different wader chick predators

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Waders breeding on lowland wet grassland have declined dramatically in recent decades and high levels of nest and chick predation prevent many species from breeding successfully enough for populations to recover. Predator management to reduce the impacts of predation on nest survival can be successful but the number of chicks fledged is often still too low to sustain populations. Relative to nest predation we know much less about the identity and importance of different chick predators in the UK. Nest predation studies use temperature loggers to determine whether predation occurs diurnally or nocturnally, thus indicating the identity of the predator groups

involved (e.g. mammals at night). Studying predation of wader chicks is much more difficult but has typically involved the use of radio transmitters and manual telemetry, with the identity of chick predators inferred from the often small percentage of recovered remains. Not only are few remains recovered, this method may also exaggerate the importance of avian predators which often pluck transmitters from chicks a short distance from where they are captured, while mammalian predators may ingest transmitters, carry them a long distance away or take them below ground. Reliably identifying the timing of predation is key to understanding the predators involved, particularly for those predated chicks whose remains are never found. Daily dawn and dusk telemetry surveys can be useful in providing this information but are time consuming and impractical. To provide a solution for this problem we used static automatic radio tracking stations to monitor signals from radio-tagged wader chicks around the clock at sites across the UK to determine whether predation occurred diurnally or nocturnally. We present our findings combined with evidence from predated remains and knowledge of predator abundance at each site, and speculate how this knowledge could be used to design management solutions.

* * *

Using Busse flat cages for detecting migration directions of small waders

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Circular orientation cages have been used for several decades to investigate orientation and navigation behaviour in birds. Usually Emlen funnel cages or its different modifications have been used, and these offer unique possibilities for the study of the migratory behaviour of birds. However the steep diagonal walls of Emlen cages seem to create unnatural conditions for waders which usually walk on flat ground. Therefore we used the Busse cage and tested small waders captured in the Vistula mouth (S Baltic) during their autumn migration. We chose the flat cage instead of the Emlen funnel, because of the flat bottom and walls covered by transparent foil. This kind of wall material is easier to obtain and cheaper than typewriter correction paper (Tipp-Ex) or thermo-fax paper and the delicate bills of waders leave clear markings on it. Moreover it is possible to count the markings immediately after the tests are finished. This pilot study covered the end of July and August. In total we conducted 141 tests on 12 species (*Calidris alba*, *C. alpina*, *C. canutus*, *C. ferruginea*, *C. minuta*, *Charadrius hiaticula*, *Arenaria interpres*, *Gallinago gallinago*, *Philomachus pugnax*, *Actitis hypoleucos*, *Tringa totanus*, *Pluvialis squatarola*). We applied modelling based on Bayesian statistics enabling the analyses of multimodal circular distributions. Here

we present the results of the tests on adult Dunlins (N = 57). The migration directions of the Dunlins tested were generally similar to those found using ringing recoveries and resightings, with individual birds following both coastal and inland migration routes. However we also found that some birds showed a northerly direction, which could be local birds aiming for favourable feeding sites along the north coast of the Gulf of Gdańsk (i.e. the Hel Peninsula).

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Stopover and departure decisions - selected factors affecting stopover duration in Dunlin

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We analyzed stopover duration of Dunlins *Calidris alpina* trapped at the Vistula Mouth (N Poland) during autumn migration. Birds were trapped in walk-in traps on a daily basis (73 days, between 15 July and 25 September, 1994-2000), sexed using discriminant functions and aged (two age-classes: juveniles and adults). Capture-recapture data were analyzed with CJS constrained models in program Mark. Estimated survival probabilities were then translated to expected stopover duration (i.e., the probability of staying in the area) by simple formulae. We fitted several basic models differing in the structure of the survival parameter: constant, time-dependent, age-dependent, sex-dependent or age- and sex-dependent. These simple models performed poorly, and models including individual covariates explained much more variation in the data. Four individual covariates were considered: bill-length as the indicator of within-group size (i.e., additive to sex-dependent variation in size; Dunlin males are smaller than females), body-mass at first capture, moult-score and an 'adult-buff' index (the two latter only in adults).

In all years adults stopped over for a significantly shorter time (1.0-1.5 days) than juveniles (1.8-3.0 days). At the individual level, the crucial driver of stopover duration was body mass at first capture with lighter birds stopping over for a longer time, and this effect was frequently (though not in all cases) present in males of both ages. We conclude, that juvenile Dunlins stop over at the Vistula Mouth for a longer time than adult birds, probably due to their less efficient feeding. Individual birds adjust stopover in response to their current body mass.

First results of individually colour-marking Dunlin *Calidris alpina* in S Belarus

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Dunlin *Calidris alpina* is a common migrant in S Belarus. In spring, major roosting sites of migratory Dunlins can be found on the Pripyat floodplain. The total number of migratory Dunlins in S Belarus are estimated at about 3,000-5,000 birds.

During 1999-2011, 480 Dunlins were ringed with metal rings at the Turov Ringing Station, Gomel Region (52.04°N 27.44°E). Only two recoveries were obtained from these birds (from Italy and Germany). Therefore the recovery rate from metal rings was 0.42%.

From spring 2012, we started individually colour-marking migratory Dunlins. We registered a colour-ring scheme with a yellow plastic ring with black inscription (A00-A99; B00-B99; C00-C99; D00-D99) on the left tarsus and plain yellow ring on the right tarsus.

By 10 Aug 2014, a total of 19 resightings from 17 colour-ringed Dunlins had been reported. The recovery rate from colour-ringed birds was 7.0%. Thus, the colour-marking can increase recovery rate by more than 16 times.

The overall picture of Dunlin migration is that birds migrating to the breeding grounds will stage on the Pripyat floodplain in spring, but return to Mediterranean wintering grounds via the coasts of the Baltic and North Sea (and probably European Atlantic coast). Eleven resightings from 9 birds were obtained during winter 2012-2013 and 2013-2014 near Venice (Italy).

The breeding locations of the Dunlins migrating through S Belarus remain unclear.

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Light grazing of salt marshes is a direct and indirect cause of nest mortality in Common Redshank *Tringa totanus*

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Common Redshank *Tringa totanus* populations breeding on British salt marshes have reduced by >50% since 1985, with declines linked to changes in grazing management. Conservation initiatives have encouraged low-intensity grazing but redshank have continued to decline. This study quantified effects of grazing intensity on redshank nest survival over a range of livestock densities on six lightly-grazed salt marshes in the Ribble estuary, NW England. We asked 'does grazing result in nest mortality: (a) directly through cattle-trampling and/or (b) indirectly through grazer modification of landscapes that accelerate predation risks?' Grazing induces nest mortality directly through the trampling of nests and indirectly, possibly by diminishing the level of vegetation cover, which can shelter nests against predators. Cattle density was recorded both during the redshank breeding season and for a calendar year. Model predictions showed that risk of nest loss to trampling increased from 20% at 0.15 cattle ha^{-1} to 97% at 0.82 cattle ha^{-1} in the breeding season. The risk of a nest being predated increased from 31% with no grazing to 91% at a 0.43 cattle ha^{-1} y^{-1} based on all-year grazing data. These results show that even light conservation grazing can reduce redshank nest survival rates to near zero. We discuss the implications of these results, suggesting that it may be appropriate to reduce salt-marsh grazing intensities, graze salt-marshes with older cattle or change the timing of salt-marsh grazing to reduce the number of livestock present during the redshank breeding season.

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Preferences for nest-site and chick-rearing habitat in an association of waders in one Siberian marshland

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Nesting birds apply various anti-predator tactics including cryptic nesting, choosing safe habitats for rearing chicks, as well as active defense or clumping. These tactics vary among species and may differ between the nesting and chick-rearing periods. The range of preferences for nest-sites and chick-rearing habitats was surveyed in a wader community in the Svjatoj Nos marshlands, Lake Baikal, Russia in 1993, 2013 and 2014. The habitats were formed by different plant associations including dominant bog-bean *Menyanthes trifoliata*, sedges *Carex* spp. and mosses.

Drier habitats with sparse vegetation cover were generally preferred by waders in their choice of nest-sites. Some species tended to nest in loose aggregations and/or in tight association with other waterbirds such as gulls or terns.

Chick-rearing habitats were considerably different from nest-sites. In particular, they included sparse vegetation consisting of moss cover with bog-bean monocultures, partly alternating with patches of open water surface. We presume that the explanation for this is that this habitat offers a better food supply as well as ground that is easier for the chicks to traverse and escape predators. These habitats were almost identical to those where non-breeding waders (unsuccessful breeders or migrants) were observed. The likely antipredator strategy of waders in these habitats was grouping which led to a higher efficiency in detection of approaching predators and collective defence against them. The most active attackers against potential predators were Northern Lapwings *Vanellus vanellus* and Eurasian Curlews *Numenius arquata*. They created a protective umbrella which was used also by other species such as Wood Sandpiper *Tringa glareola* and Marsh Sandpiper *T. stagnatilis*, which did not participate in aggressive attacks. The only species that used the same habitat for nesting and chick-rearing was Long-toed Stint *Calidris subminuta*.

The Svjatoj Nos marshlands afford many opportunities for waders to apply diverse antipredator tactics which often have a mutualistic aspect.

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Feeding ecology and trophic adaptation of the Spoon-billed Sandpiper *Eurynorhynchus pygmeus* (Charadriiformes, Calidridinae)

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The feeding ecology of the Spoon-billed Sandpiper *Eurynorhynchus pygmeus* is discussed and a version of its trophic adaptation is proposed. Trophic adaptation is recognised based on the synthesis of functional analysis of the feeding apparatus and feeding ecology. To gain a better understanding of adaptations of the Spoon-billed Sandpiper, key trophic adaptations of the subfamily Calidridinae are considered in a similar manner. We analysed the feeding behaviour of the Spoon-billed Sandpiper based on 43 observations on the breeding grounds in E Siberia. In 31 cases, the feeding area of the bird was terrestrial; in 12 cases, it was in aquatic. During aquatic feeding sessions, dabbling was the most frequent behaviour. The analysis of food consumed by Spoon-billed Sandpiper is based on the contents of 15 stomachs. The main items found were beetles, adult crane-flies (Tipulidae), nonbiting midges (Chironomidae), and larval nonbiting midges. The key trophic adaptations of Calidridinae are connected

with the consumption of larval crane-flies, larval nonbiting midges, oligochaetes, and active surface (including flying) invertebrates. The Spoon-billed Sandpiper is well adapted for capturing larval nonbiting midges (adversely affecting its capability for probing the mossy sod layer). This ability is the crucial adaptation of the Spoon-billed Sandpiper to shortages of active surface invertebrates, which is particularly necessary when there is a drop in temperature during the breeding season.

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Breeding density dynamics of some subarctc wader species in southern Chukotka, Russia

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Very low densities of breeding waders were observed in 2010-2013 in the vicinity of Meinypilgyno, S Chukotka. Mapping of pairs, nests and broods for the best surveyed areas (7.5 km^2 for most species and 90 km^2 for Spoon-billed Sandpiper *Eurynorhynchus pygmeus*) revealed the following ranges of densities in different years (pairs/km^2): 0.8-1.9 for Ringed Plover *Charadrius hiaticula*, 1.5-2.1 for Lesser Sand Plover *Ch. mongolus*, 1.1-1.2 for Red Knot *Calidris canutus*, and 0.1 for Spoon-billed Sandpiper. Inter-annual variation in breeding density was the lowest in the latter two species. In Ringed Plover it doubled over the past three years. At the same time, densities of Lesser Sand Plover were highly variable with 2011 and 2013 having the highest and lowest values respectively. Individual colour-marking data indicated that higher return rates (presumably a correlate of annual survival) are typical for three monogamous species: 82% in Red Knot males (n=33), 77% in Ringed Plover males (n=13) and based on published data (Tomkovich 1994; Zöckler *et al.* 2010) 63-67% in the combined sexes of Spoon-billed Sandpiper. The lowest annual return rate to the area was recorded for Lesser Sand Plover (50% in males, n=20). Apparently some Lesser Sand Plovers are successively polygamous and move large distances in search of mates or follow them, which may explain both their lower return rate and fluctuations in the breeding density.

Long-term data on breeding dynamics of the NW Iberian Kentish Plover *Charadrius alexandrinus* population: is population survival ensured?

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The Kentish Plover is the only wader nesting on the Atlantic coast beaches of N Spain. In the stretch of the Spanish coastline between Portugal and France, the nesting population is located exclusively in Galicia. This wader is considered of priority for conservation in the European Union (it is included in the Annex 1 of the Birds Directive) and shows signs of decline in several areas along the Spanish coast and across much of Europe. The Galician population, mostly consisting of resident birds, selects sparsely vegetated beaches for foraging, roosting, nesting and rearing young. The lifestyle of this population makes them especially vulnerable to human activities, in particular disturbance and/or destruction of breeding sites, natural predation, and habitat loss (which is predicted to be particularly high among low-lying coastal systems because of their vulnerability to sea-level rise). We analyze population trends and nesting success over a 15-year period in order to evaluate population trajectory and to predict future changes in population size and so viability. Over the 15 years, the Galician Kentish Plover population averaged 70 breeding pairs with a moderate increasing trend. We monitored 1,560 nests to estimate reproductive success. Over this period, 10% of known-fate nests hatched at least one chick and 25% of chicks hatched reached fledging. Under these conditions, population viability seems impossible if there is a lack of immigration. We argue for intensive population management, especially of predation, and we stress the need for continued efforts to protect the birds from human disturbance and habitat loss and degradation.

Workshop: Threats and protection of meadow birds in Europe

Meadow breeding waders in Iceland: Status and prospects

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Seven species of waders are common breeders in habitats which could be classified as meadows in Iceland; Eurasian Oystercatcher *Haematopus ostralegus ostralegus*, Eurasian Golden Plover *Pluvialis apricaria altifrons*, Black-tailed Godwit *Limosa limosa islandica*, Whimbrel *Numenius phaeopus islandicus*, Redshank *Tringa totanus robusta*, Common Snipe *Gallinago gallinago fareoensis* and Dunlin *Calidris alpina schinzii*. All these species are also frequent breeders in other habitats. All waders and their eggs are protected by law in Iceland. Densities are generally highest in coastal lowland areas and in wetter habitats. There are no long-term monitoring data for waders in Iceland and single-species demographic estimates are scarce. Recent population estimates are available for South Iceland, the largest lowland basin, which supports populations that in this area alone are of international importance. Lowland wader habitats in Iceland are being altered at an alarming rate, with expanding agriculture, infrastructure and housing. No conservation measures are aimed at waders.

Conservation status of meadowbirds in Denmark and Sweden

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Along the lengthy coastlines of Denmark and S Sweden, there are thousands of km of coastal meadows, and in Denmark there are also quite extensive polder areas, which also hold a large number of wet grassland breeding waders.

For decades there has been a large-scale monitoring programme covering the southern counties of Sweden in which all the breeding birds on all the coastal grasslands have been surveyed every 5-6 years. However, in Denmark there is no national monitoring programme covering the more widespread species like Eurasian Oystercatcher, Northern Lapwing, Eurasian Curlew and Redshank, and here knowledge of meadow waders is more fragmentary.

In both countries, Northern Lapwings and Redshanks are the most numerous breeding waders on wet grassland with approximately 15,500 and 14,000 pairs, respectively. While numbers of both species on wet grassland remained stable in Denmark during 1970-2014, in Sweden lapwings have declined and probably also Redshanks. However, in both countries the majority of breeding lapwings are found on arable land, and in this habitat there have been a continual strong decline in Denmark, and recently also in Sweden.

The two countries hold >50% of the Baltic biogeographic population of Dunlin, at present 275 pairs. This is <25% of the population of 40-50 years ago, with the largest decrease taking place between 1990 and 2005. In Denmark, most pairs are now concentrated in four sites where the species benefits from favourable management, and where numbers are similar to those of 1970. The decline in Ruff is even worse, and the 100-200 breeding females left in Denmark and Sweden is <10% of the number in the late 1960s. Since 1990, Black-tailed Godwits have declined strongly in both countries. Before 1990 they had increased in Denmark, and the 510 pairs in 2014 is similar to the number in 1975, but in Sweden the present 90 pairs is much lower than 40-50 years ago. The small numbers of Eurasian Curlews in Denmark have been increasing at least until recently, whereas the much larger Swedish population has been decreasing for years. Eurasian Oystercatchers were increasing until around 1990, but have been decreasing in both countries since then.

In a few selected key meadowbird sites, management has been fine-tuned, with late mowing and controlled grazing. In general, however, the conservation of wet grassland

has been accomplished with funding from agri-environment schemes with grazing agreements, but without very specific conservation arrangements. This seems to work well in Denmark for the widespread and less specialized meadowbirds, but less so in Sweden. It is not fulfilling the demands of the more specialized meadowbirds with smaller habitat niches. Baltic Dunlins and Ruffs are now more or less confined to a very few sites, where it is possible to control management in great detail and to keep a sufficiently high freshwater-table. Both species were displaced from wet grassland elsewhere, where they were widespread 40-50 years ago. Currently, the same process is apparently affecting Black-tailed Godwits in that they disappear from some former breeding sites every year. In many cases the management actions that could improve the situation are well known, but rarely are the financial resources available to implement such actions and the necessary changes in management.

Status and conservation of meadowbirds in Finland, Estonia, Latvia and Lithuania

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There are at least 13 species of waders which are regular breeders on grasslands in the eastern Baltic area: Eurasian Oystercatcher, Ringed Plover, Northern Lapwing, Temminck's Stint, Dunlin, Ruff, Common Snipe, Great Snipe, Black-tailed Godwit, Eurasian Curlew, Marsh Sandpiper, Redshank and Red-necked Phalarope.

Most typical grasslands include semi-natural habitats like coastal meadows (common in W Estonia and along the Bay of Bothnia), floodplain meadows, agricultural grasslands, and polders, which are most abundant in Latvia and Lithuania (where there are also many fishponds that are useful to several wader species). In these areas, mires, islets, quarries and arable fields are also important habitats for breeding waders.

Degradation of the once diverse and abundant wader communities of semi-natural grasslands has been recorded since the 1950s and has usually been associated with the cessation of agricultural management. At the same time, some meadowbirds like Northern Lapwing, Black-tailed Godwit and Dunlin have gradually occupied inland mires, though these local increases have not balanced the general decline. Locally, the overgrowing of habitats has often been accompanied by an increase in predation levels. In agricultural landscapes, intensification of management poses a threat to bird populations, while the dynamics of the Northern Lapwing, the most numerous breeding wader in the region, has shown spatial variability in trends.

Conservation actions in the region include use of AES resources for semi-natural grassland management and compiling national action plans for the species most endangered. Tens of LIFE-Nature projects and numerous other local conservation activities, including voluntary work, have contributed to habitat restoration and management in the area.

Threats and protection of meadow waders in Central-East Europe

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This contribution summarises current population numbers, trends, threats and protection measures of meadow breeding waders in Central-Eastern Europe, namely: the Czech Republic (CZ), Slovakia (SK), Poland (PL) and Hungary (HU). Population estimates are given in numbers of breeding pairs.

Northern Lapwing *Vanellus vanellus* is the most common species with the widest distribution in all countries: PL 90,000–120,000, HU 29,000–38,000, CZ 7,000–10,000 and SK 2,000–4,000 breeding pairs. Lapwings mainly inhabit grasslands in PL and HU, but arable land is the main breeding habitat in CZ and SK. The long-term trend (*ca*. 1970–2014) is a strong decline in all countries. Where known, medium- and short-term trends also show strong declines, only in CZ and HU is the short-term trend (*ca.* 2004–2014) stable. Common threats to grassland-breeding lapwings in all countries and major factors driving these trends are: drainage of grasslands, conversion of grasslands to arable land and high fertilizer input in meadows (leading to overgrowth). Overgrowing of grasslands due to abandonment of grazing in HU, an increase in predation pressure in CZ and PL and fishpond cultivation intensification in CZ and SK also play a role. Large-scale effective protection is generally lacking however protection in small-scale nature reserves (NR) can work well. Conservation measures in CZ consist of non-effective agri-environment schemes (AES) – postponed mowing of meadows (outside the main lapwing breeding sites), but efficient small-scale measures (NR with high water table, direct nest protection). Predator removal proved effective in PL. Hopefully more effective AES for lapwings on arable land is going to be launched in CZ.

Black-tailed Godwit Limosa limosa limosa is most numerous in PL (1,500–2,000 pairs), there are less in HU (120–600) and CZ (5–10), and the species is now extinct in SK. Godwits inhabit mainly grasslands (meadows and pastures), but the majority of the population in CZ breeds on arable land. Long-, medium- and short-term trends are of a strong decline for PL and CZ. The main factors driving the declines are the

same as for lapwing. Effective large-scale protection measures are generally lacking. Part of the population in PL is protected in National Parks (NP) and NR, direct nest-site protection works well in CZ.

Common Redshank *Tringa totanus totanus* is most abundant in PL (1,000–1,500 pairs), with less in HU (400–1,000), CZ (25–40) and SK (20–50). Redshanks inhabit meadows and pastures, also partly-flooded pond-bottoms in CZ and marshlands in arable land in CZ and SK. Long-term trends are a strong decline in PL and CZ, a decline in SK and fluctuating numbers in HU. Medium-term trends are strong declines in PL and CZ, the short-term trend in CZ is probably stable. The main factors driving the declines are the same as for lapwing. Effective large-scale protection measures are generally lacking. Protection measures are the same as for Black-tailed Godwit in PL; protection in CZ and SK consists of NR, direct nest-site protection is applied effectively for part of the population in CZ.

Eurasian Curlew *Numenius arquata arquata* is most abundant in PL (200–300 pairs), with less in HU (20–60) and CZ (1–3). The species is now extinct in SK. Curlews mainly inhabit grasslands (meadow and pastures). Long-, medium- and short-term trends are a strong decline in PL and CZ. Numbers have also declined in HU but to what extent is not certain. The main factors driving the declines are the same as for lapwing; another factor in PL is the overgrowing of meadows and pastures by higher vegetation and bushes due to abandonment of grazing and harvesting and an additional factor in CZ is higher disturbance. Effective large-scale protection measures are generally lacking. In PL, protection measures are the same as for Black-tailed Godwit, there are no protections measures in CZ (the last breeding site is the airport).

Common Snipes *Gallinago gallinago gallinago* breed regularly in all countries: PL 33,000–71,000 pairs, CZ 500–800, HU 300–600 and SK 30–100. Common Snipes inhabit lowland grasslands (meadows and pastures) as well as peat-bogs in more forested landscapes at higher elevations. In PL, all trends are of probable decline, with numbers fluctuating in HU. Long-term trends are a strong decline in CZ and SK; medium- and short-term trends are also of strong decline in CZ. In PL, the main factors driving the declines are unknown. In CZ and SK, conversion of meadows to arable land, drainage of wetlands, high fertilizer input and drainage of meadows are assumed to be the main threats. Protection measures are the same as for Black-tailed Godwit in PL; AES on meadows have not been evaluated, but are probably ineffective in CZ. Protection in NR works well in some parts of CZ and SK.

Great Snipe *Gallinago media* only breeds in PL where 300–350 displaying males occur on lowland marshes, pastures and meadows. At all sites the trend is probable decline. The main factors driving decline are habitat loss, human disturbance and predator pressure. Most sites are protected as NP or NR.

Eurasian Oystercatcher *Haematopus ostralegus ostralegus* only breeds on sandy coastlines and along large rivers inland in PL (15–25 pairs). It is not a grassland wader in PL. Up to 1990, numbers probably increased slightly; they then stabilised. Main threats are habitat loss, human disturbance and predator pressure. Protection is generally lacking, some sites are included in NR.

Wood Sandpipers *Tringa glareola* breed in PL on peat-bogs and the edges of reservoirs (0–5 pairs). The trend is a strong decline, but driving factors are unknown. Most breeding sites are within NP or NR.

Ruffs *Philomachus pugnax* breed in PL in lowland grasslands with only 0–2 breeding females following a strong decline. Driving factors are probably habitat loss, human disturbance and predator pressure. The breeding site is in NP.

Dunlins *Calidris alpina schinzii* breed in PL on coastal salty meadows with only 0–1 pairs following a strong decline. Driving factors are habitat loss, human disturbance and predator pressure. Conservation activities include the control of grazing and harvesting to stop overgrowth of coastal pastures.

Meadow waders in European Russia: main habitat types, numbers, recent population trends and key affecting factors

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In European Russia, eight wader species can be considered meadow-birds, as meadows of various types are their main or a major nesting habitat. In 2000-2012, the approximate breeding populations of these species were: Northern Lapwing *Vanellus vanellus* – 500,000–850,000 pairs; Eurasian Curlew *Numenius arquata* – 45,000–100,000 pairs; Black-tailed Godwit *Limosa limosa* – 15,000–30,000 pairs; Redshank *Tringa totanus* – 25,000–70,000 pairs; Marsh Sandpiper *Tringa stagnatilis* – 12,000–30,000 pairs; Baltic Dunlin *Calidris alpina schinzii* – 10–25 pairs (probably underestimated); Great Snipe *Gallinago media* – 50,000–120,000 displaying males; and Ruff *Philomachus pugnax* – 120,000–400,000 breeding females.

The main breeding habitat of Ruff is floodplain meadows within the forest zone, but the overwhelming majority of Ruffs nest on the tundra. Seven of the eight species prefer to breed on floodplain meadows used as pastures, whereas Eurasian Curlew breed on unflooded meadows. Peatbogs are the second most important habitat for curlew, supporting more than half of the total population. Arable land is important for breeding Northern Lapwing, and often supports the highest densities. Eurasian Oystercatchers *Haematopus ostalegus* (spp. *longipes*) only use meadows for nesting in some restricted areas and cannot be considered to be meadow-birds in European Russia. The total population of this inland subspecies is estimated at 3,600–5,100 breeding pairs.

Since the beginning of the 1980s in European Russia as a whole, broadly negative trends have been recorded for seven of the eight meadow wader species and for Eurasian Oystercatcher. However, temporary increases were recorded in some areas in the 1990s, due to reduced farming activities associated with the collapse of communist-type agriculture. For Black-tailed Godwit, overall long-term and short-term trends are unknown, because numbers have fluctuated inconsistently between different regions. For the same reason, it is not possible to assess the overall short-term trends during 1990-2012 of Eurasian Curlew, Redshank and Marsh Sandpiper for European Russia as a whole. The most catastrophic fall in numbers was recorded in Baltic Dunlin and in meadow populations of Ruff. The breeding ranges of both species also contracted.

The main reason for the negative trends in meadow waders is the continuing depression of the farming industry in many regions. This has led to the loss of huge

areas of wader nesting habitat through the overgrowing of meadows by tall dense weeds and bushes in abandoned hay meadows and pastures. Recently wide-scale burning of dry vegetation in spring has affected waders both positively and negatively. Early spring fires form open sites, which frequently constitute the only suitable nesting habitat among the overgrown hay meadows and pastures. However, many clutches are directly lost to fire or to predators in the sites that have been opened up by burning.

In coastal habitats, there has been appreciable growth in recreation pressure, and this is the main reason for the decline in Eurasian Oystercatchers and one of the main reasons for the decline in Baltic Dunlins.

The nature and intensity of farming activity as well as the timing and scale of floods are the most important factors influencing the demography of meadow waders. Ruff, Great Snipe and Baltic Dunlin sometimes leave their breeding sites and do not nest in the years with unfavourable flooding. Depending on the weather and the timing of sowing crops in different years, the survival of the first Northern Lapwing clutches in the same maize fields and perennial crops can vary from 0.5% to 74%. An increase in the breeding success of Black-tailed Godwits and Eurasian Curlews was recorded when there was a reduction in the intensity of grazing and the birds nested colonially in limited areas of suitable habitat.

Baltic Dunlin, Eurasian Oystercatcher (spp. *longipes*) and Eurasian Curlew are included in the Red Data Book of the Russian Federation. Black-tailed Godwit, Marsh Sandpiper and Great Snipe are included in the list of species requiring special attention annexed to the Red Data Book. Some meadow wader populations are protected in several well-controlled nature reserves, national parks and local reserves. But there are no special measures for the active protection and habitat management of meadow waders in Russia, except a few small pilot areas. A joint international project to save the critically-endangered Baltic Dunlin is vitally necessary.

Status and conservation of waders breeding on grassland in Germany

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The most recent population estimates for waders breeding on grassland in Germany are Northern Lapwing 63,000-100,000 pairs, Eurasian Curlew 3,700-5,000 pairs, Black-tailed Godwit 3,900-4,400 pairs, Common Snipe 5,500-8,500 pairs, Redshank 11,000-17,500 pairs, Ruff 19-26 females, and Dunlin 8-14 pairs. By far the most Redshanks breed on coastal salt-marshes and a high (but unknown) proportion of Lapwings can still be found on arable land. All other meadow waders nest on lowland grassland.

Except Curlew and Redshank all species have declined by more than 50% since 1990. Curlew and Redshank have had more or less stable populations. The declines of all species except Snipe and Curlew were stronger inland than on the coast and in coastal marshes. Consequently inland breeding ranges have contracted.

The protection of meadow-birds in Germany is mainly attempted through agri-environmental schemes and by purchasing land for wet grassland reserves. The success of conservation measures is related to both the quantity and quality of habitat management. Data from 89 wet grassland conservation projects in Germany show that successful management addressed both hydrology and farming practices. The amount of care-taking (number of jobs available for monitoring and management) also seems to be important.

Status and conservation of meadow birds in the Netherlands

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Meadow bird populations have declined strongly in the Netherlands since the 1960s. In the period 1990-2013, for which good monitoring data are available and declines are most pronounced, Black-tailed Godwit *Limosa limosa* numbers dropped by *ca*. 57%, Northern Lapwing *Vanellus vanellus* by 45%, Eurasian Oystercatcher *Haematopus ostralegus* by 65%, Redshank *Tringa totanus* by 19% and Eurasian Curlew *Numenius arquata* by 37%. Other, previously numerous meadow birds such as Ruff *Philomachus pugnax* and Common Snipe *Gallinago gallinago* have virtually disappeared as breeding birds from the Netherlands.

The most likely causes for these declines are the intensification of agriculture, leading to low ground-water-levels, frequent, early and synchronised mowing and monotonous and dense swards with low insect availability, aggravated by high predation rates and climate change. These factors negatively affect reproductive output and especially chick survival of meadow birds.

Meadow bird protection in the Netherlands consists of agri-environment schemes (AES, mainly nest protection and postponed mowing), voluntary nest protection and reserves, in this order of importance in terms of hectares. However, AES have so far proved ineffective in the Netherlands. Many AES are applied in unsuitable areas. In addition, nest protection is an important measure, but it has its drawbacks: predation rates may increase due to visits to nests, and chick survival is not improved by this measure. To improve the effectiveness of AES, effort is now increasingly concentrated in core areas, where landscape features enhancing meadow bird population trends, such as openness and water-levels, are easier to control. In the future, reform of the Common Agricultural Policy, decentralisation of conservation efforts and banning of the milk quota will likely affect meadow bird trends and conservation in the Netherlands.

Conservation and recovery of lowland waders: a UK perspective

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Breeding wader populations are disappearing from large parts of the countryside across Europe. In the UK, reserves and protected areas now hold an increasingly high proportion of the remaining populations, but they often suffer high predation levels. Populations outside of protected areas are low and constrained to small and isolated patches of remaining high-quality habitat in the wider countryside. To conserve and recover wader populations, we need to (a) ensure the sustainability of populations within protected areas by protecting them from predation and (b) target limited agri-environment resources towards wider countryside areas where we have the best chance of restoring habitat quality and where the waders have the best chance of recruiting to restored areas. Here, we will discuss the efficacy of different options for reducing predation in protected area populations. We will end with a case-study to demonstrate how landscape-scale targeting of AES resources in combination with protected area management can be an effective approach for recovering wader populations on lowland wet grasslands.

Excursions

Arctic migration on Cape Põõsaspea (#1)

Cape Põõsaspea is one of the best places to visually follow migration along the Siberian - East-Atlantic Flyway. Most common species that may be observed during the last days of September are Long-tailed Duck, Black Scoter, Velvet Scoter, Scaup, Tufted Duck, Wigeon, Barnacle Goose, Brent's Goose, Black-throated Diver, Red-throated Diver etc. Also waders and passerines are expected. In autumn 2014 there's a monitoring programme running at Põõsaspea, by the beginning of September 1 million birds had been counted passing. Check for more at http://www.eoy.ee/poosaspea/home.

Depending on migration intensity and preliminary information we might make a stop on coastline at Haversi. It is the best wader stopover site in Estonia with an impressive list of rarities sighted here.

This trip is for people who enjoy seawatching. It might be windy in Põõsaspea, bring warm clothes! At both sites scopes are essential. Take your own, if possible.

* * *

Coastal meadows of Matsalu National Park (#2)

There are ca 6000 hectares of managed coastal and floodplain meadows in Matsalu NP. We will visit Põgari and Haeska coastal meadows which are breeding sites for Baltic Dunlin, Black-tailed Godwit, Avocet and other meadowbirds. Põgari is one of the best places to observe migrating waders during their stopover in Matsalu NP. If lucky we can also see cranes flying out from a roost.

This trip is a bus trip with a walk of three kilometers on a coastal meadow in Haeska. Wearing hiking boots is recommendable. Bring your scope or binoculars - there will be waders and other waterbirds foraging on the coast. As there's a possibility to buy coffee from the farmer in Haeska, you might want to bring some cash with you.

* * *

Marimetsa Bog (#3)

The walk will take us through the breeding habitats of Whimbrel, Golden Plover, Black-tailed Godwit, Lapwing, Golden Eagle, Capercaillie etc.

The trip is somewhat physically demanding. If you prefer your feet dry, please bring wellingtons! Also, take your binoculars - waders have left their breeding grounds months ago but there is still a chance to see some woodpeckers, Black Grouse etc.

Linnuraba („Bird Bog“) Bog (#4)

The second bog trip also takes us to the breeding habitat of waders. Again, waders have left by the time we get there, but woodpeckers, Black Grouse, Capercaillie and Golden Eagle might be around - so take your binoculars!

This trip is ranked difficult (or fun): there is no prepared track, we will walk on the unstable surface of a peat bog. You might find yourself crashed knee-deep in the bog. Bring wellingtons (getting away with dry feet is still not guaranteed)!

* * *

Cultural walk in Haapsalu (#5)

Haapsalu is a town that dates back to the 13th century. This guided walk will take you to the most important places of the history of Haapsalu. But while on a cultural walk, you can't miss shallow bays that are good migration stopovers for waterbirds. Please note that this excursion departs later than other trips - at 9:30.

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